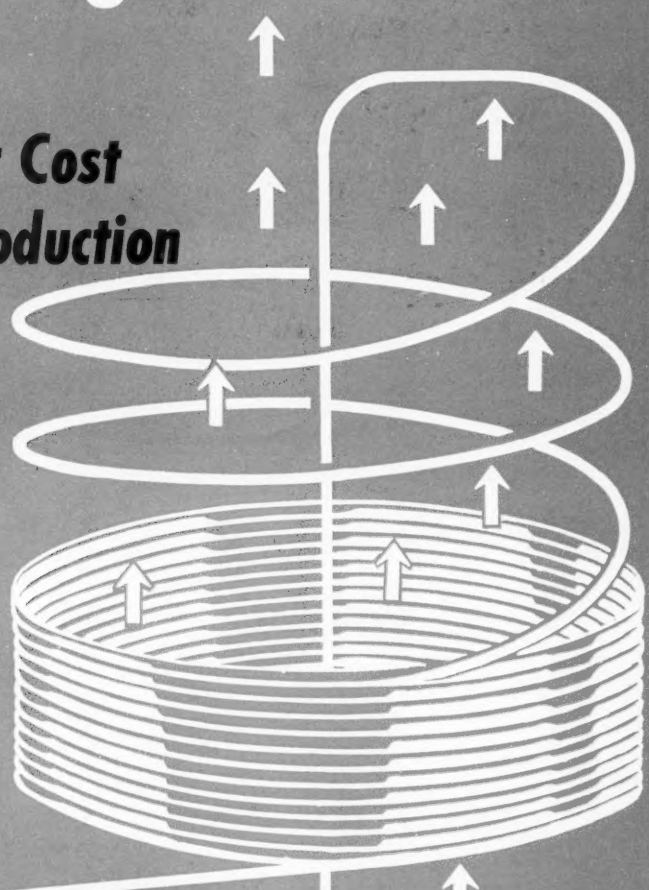
# WIRE AND WIRE PRODUCTS

AUGUST 1946


## The Morgan-Connor Principle

*Low Die Cost*
*Low Power Cost*
*High Production*



1 Cold work on the wire produces heat

2 Heat is removed from the wire by air-cooling

3 Low temperature maintains lubrication—resulting in low die costs

4 Low temperature preserves physical properties of high carbon wire

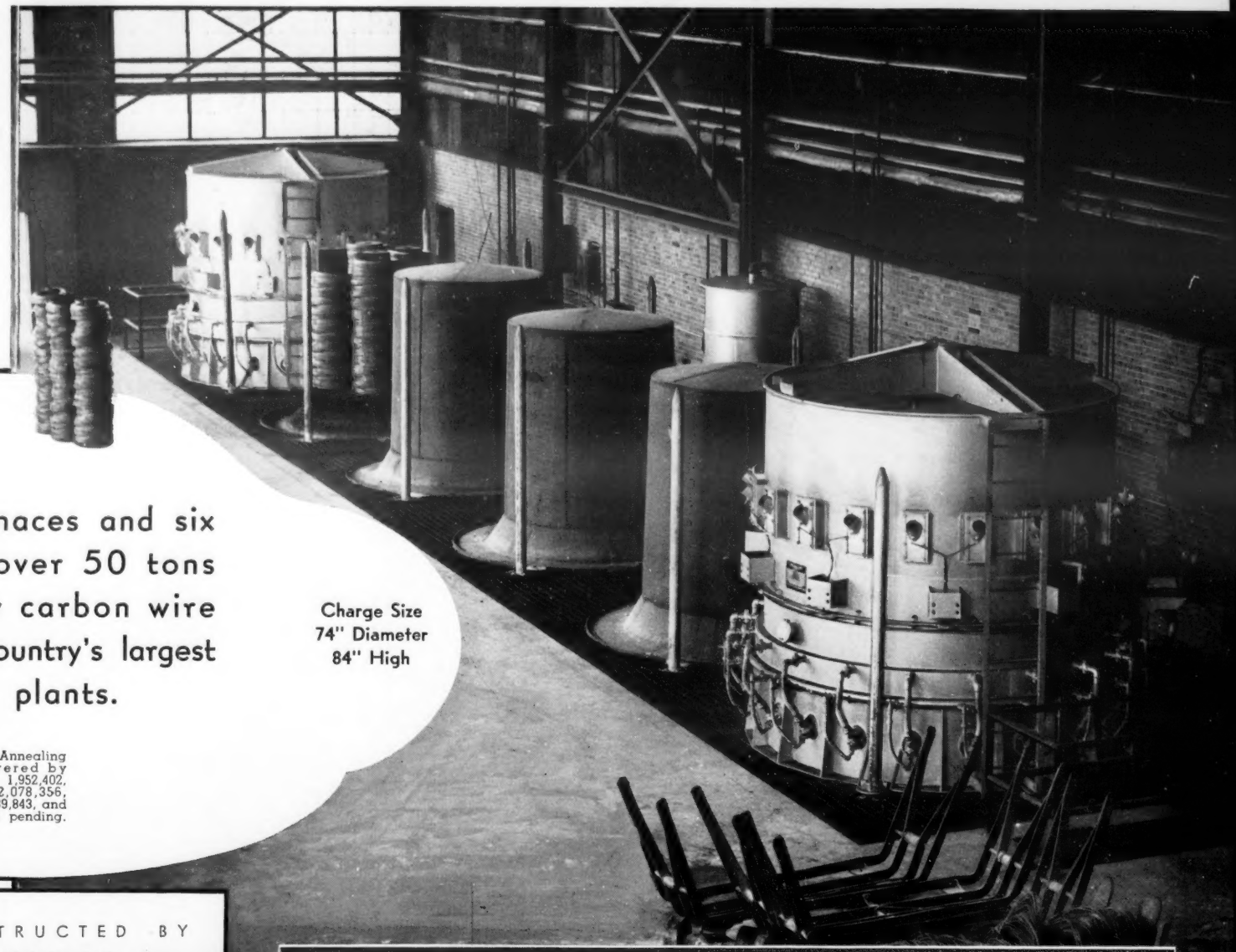
MORGAN CONSTRUCTION CO.
WORCESTER, MASS.

WM-5


OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

# For HEAVY PRODUCTION Requirements

## The Lee Wilson MULTIPLE STEM WIRE ANNEALING Furnace



These two furnaces and six bases anneal over 50 tons per day of low carbon wire at one of the country's largest wire producing plants.

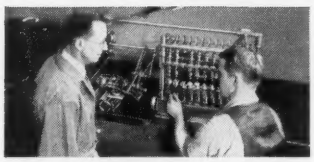
Charge Size
74" Diameter
84" High

The Wilson Annealing Unit is covered by Patents Nos. 1,952,402, 2,068,477, 2,078,356, 2,081,612, 2,089,843, and other patents pending.

ENGINEERED AND CONSTRUCTED BY
Lee Wilson ENGINEERING CO., Inc.
20005 West Lake Road CLEVELAND, OHIO
Telephone ACademy 4470

INDUSTRIAL FURNACES ★ RADIANT TUBE HEATING ★ HEAT TREATING PROCESSES

# There's more to THIS Package than meets the eye!

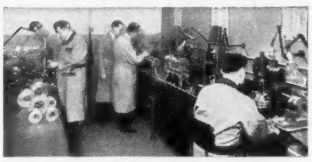


**SERVICE CENTERS AND FIELD ENGINEERS**

Here's "double-help" for you: Completely equipped Die Service Centers (in Detroit, Chicago, Pittsburgh & Thomaston)—AND expert field Engineers—both available to help you in servicing or finishing dies.

**LOCAL STANDARD STOCKS TO SUPPLY YOU PROMPTLY**

A great aid to you in maintaining production schedules! Stocked in Detroit, Los Angeles, Pittsburgh, Chicago and Thomaston, Conn.—assuring speedy delivery in metal-working areas coast-to-coast.



**FREE TRAINING OF YOUR PERSONNEL**

In Carboloy's Die Training School in Detroit, your die room personnel receive thorough training in carbide die application and maintenance methods. Up-to-the-minute training for newcomers or seasoned veterans!

**APPROVED DIE ROOM EQUIPMENT**

Die finishing and servicing equipment made or recommended by Carboloy assures you of an efficient die room. Combine well-trained personnel with high-efficiency equipment and it spells fast die finishing in *your* mill.

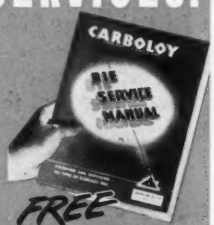
## TOP QUALITY DIES PLUS 4 VALUABLE "BONUS" SERVICES!

Any way you look at it, you can't beat the value wrapped up in Carboloy "Complete Package" Die Service! In addition to dies which pay their way many times over because of advantages like these:

- UNUSUALLY LONG LIFE,
- CLOSER TOLERANCES ON DRAWN PARTS,
- FEWER "REJECTS",
- LOWER COST PER PIECE,
- AND HIGH SURFACE FINISH,

. . . you get 4 valuable "bonus" services, which are yours without one added cent of cost.

And remember, where maximum nib strength is needed, Carboloy Cemented Carbide "forged casing" dies are the answer. Maximum support of the carbide nib is obtained by *forging* the steel casing, causing the steel to flow around the carbide nib, anchoring it securely. Carboloy Cemented Carbide Dies are available in a complete range of sizes and shapes for drawing, sizing, extruding. Write today for literature.




FREE

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Packed with handy tips. Illustrated with photos and diagrams. Send for yours *NOW.*

CARBOLOY COMPANY, INC., 11171 E. 8 Mile Street, Detroit 32, Michigan

Chicago • Cleveland • Detroit • Houston • Los Angeles • Milwaukee • Newark • Philadelphia • Pittsburgh • Thomaston, Conn.

Specify CARBOLOY (TRADEMARK) CEMENTED CARBIDES { For "Complete Package" Die Service

*Authorized Distributors:* Hartley Wire Die Co., Thomaston, Conn. • Michigan Wire Die Co., Detroit, Michigan

INDUSTRIAL FURNACES • RADIANT TUBE HEATING • HEAT TREATING PROCESSES

Lee Wilson ENGINEERING CO., Inc. 20005 West Lake Road CLEVELAND, OHIO

Imagine ten . . . twenty . . . thirty or more miles of steel wire—with the same uniform and heavy zinc coating, uniform around and tightly bonded to the wire. Impossible? Not when it's bethanized!

Bethanized wire is made by an advanced electrolytic process which actually *locks* a smooth, protective coating of 99.9 per cent pure zinc to the steel base. The bond between the zinc and the steel is so tight that the two metals may be considered as one.

Here's proof of the tight adherence and ductility of the bethanized coating:

Take a short length of bethanized wire. Twist it, wrap it around its own diameter, bend it flat upon itself, draw to a fine gage—in short, give it the works. *The coating will not be loosened in any way.*

Because of the absence of rust-inviting thin spots in the tight, uniform coating, bethanized wire is resistani to corrosion. But still greater protection against corrosion can be obtained, if conditions necessitate it, by using coatings up to three times as heavy as those specified in conventional Type 3 galvanizing.

Why not investigate bethanized wire? Give it a try—not in the easy jobs, but in your toughest forming operations. We think you'll like it . . . and that you'll come back for more. For details address the nearest Bethlehem district office, or send your inquiry to Bethlehem Steel Company, Bethlehem, Pa.

★ BETHLEHEM STEEL ★ Bethanized Wire ★

WIRE & WIRE PRODUCTS, Vol. 21, No. 8, August, 1946, Publication Office, 61 Cliff St., New York 7, N. Y. Executive Office, 300 Main St., Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Sec and Treas. Subscription price: U. S., $5.00; Canada, $5.00 per year, 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, June 14, 1946, at the Post Office, New York, N. Y., under Act of March 3, 1879.

# The New NI-ROD welding electrodes

## and the modern ROSS OVEN that bakes them

To produce an electrode with the multiple advantages of INCO'S new NI-ROD, every step in the processing from mixing the flux to baking the coat is carried out in specially designed automatic equipment.

For example, the hard, firm, dry coating on NI-ROD electrodes is the result of highly uniform control of air temperature and circulation maintained in the modern 90 foot ROSS BAKING OVEN shown above. Each electrode passes through this oven five times, back and forth, to emerge perfectly coated to the high NI-ROD standard.

The features of this ROSS OVEN mark a distinct step forward in wire and rod baking. Write us for full particulars.

### Operating Features of the ROSS OVEN

The ROSS "UNIVERSAL" 5 pass chain conveyor oven illustrated is 90 feet long and provides baking temperatures of from 125° to 450° F. depending upon type of electrode being processed. Special means are provided for varying the conditions in various zones without changing rods from one oven to another. Patented ingenious transfer devices lower rods from one conveyor pass to the other without marking or gouging.

ROSS SYSTEMS

**J. O. ROSS ENGINEERING CORP.**

DESIGNERS AND BUILDERS OF AIR PROCESSING SYSTEMS

ROSS CONTROL OF AIR FOR MODERN INDUSTRY SYSTEMS

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ROSS ENGINEERING OF CANADA, LIMITED — MONTREAL 19, P. Q.

CARRIER—ROSS ENGINEERING COMPANY, LIMITED, LONDON, ENGLAND

Page 23 of the highly-informative Catalog No. 45 (right), put out by Crescent, shows their Robertson Hydraulic Press applying lead sheath to cable.

**. . . another leading manufacturer of rubber insulated wire and cable . . .**

# CRESCENT USES ROBERTSON EQUIPMENT!

Yes . . . another of the many leading manufacturers in this field whose patronage we boast, Crescent Insulated Wire and Cable Company has long been a customer of ours. In fact, they use Robertson Lead Encasing Presses and Lead Encasing Die-Blocks EXCLUSIVELY! The specialized attention given each piece of Robertson Equipment during its construction — by skilled workers with years of experience is a great factor in the fine performance of our hydraulic machinery. And Crescent, like so many others, knows that only "quality machinery means quality products."

Robertson designs and builds all types of lead encasing machinery and hydraulic equipment including Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, Lead Sheath Stripping Machines, and Special Equipment for Special Uses.

**JOHN Robertson**
COMPANY INCORPORATED
125-135 WATER STREET, BROOKLYN 1, NEW YORK
Designers and Builders of all Types of Lead Encasing Machinery
Since 1858

# *Keying* FURNACE PERFORMANCE *to old and new production* OBJECTIVES

## F. E. I. EQUIPMENT

***Direct-Fired Cover Furnaces*** for annealing, spheroidizing, Normalizing and Bright annealing of wire, rods, coiled strip, flat sheets and tin plate.

***For Heavy Coil Loads:*** Patented Convection Base, gives 2 to 4 times longer service.

***For Wire, Bar and Tube Mills:*** Galvanizing, Patenting and Normalizing Furnaces.

***For Pipe, Sheet, and Job Plants:*** Hot Dip Galvanizing Furnaces.

Car Type Furnaces, Rod Heating, Lead Quenching, Ladle Heating and Salt Bath Descaling Furnaces.

Broadly speaking, no part of mill equipment today offers greater opportunities for reducing operating troubles, improving quality and reducing cost, than does furnace equipment.

This is so partly because of difficulties inherent in the subject itself and partly because in equipping new or old mills, the fact is too frequently overlooked that heating furnaces are production tools second to none in affecting quality, quantity and cost of output.

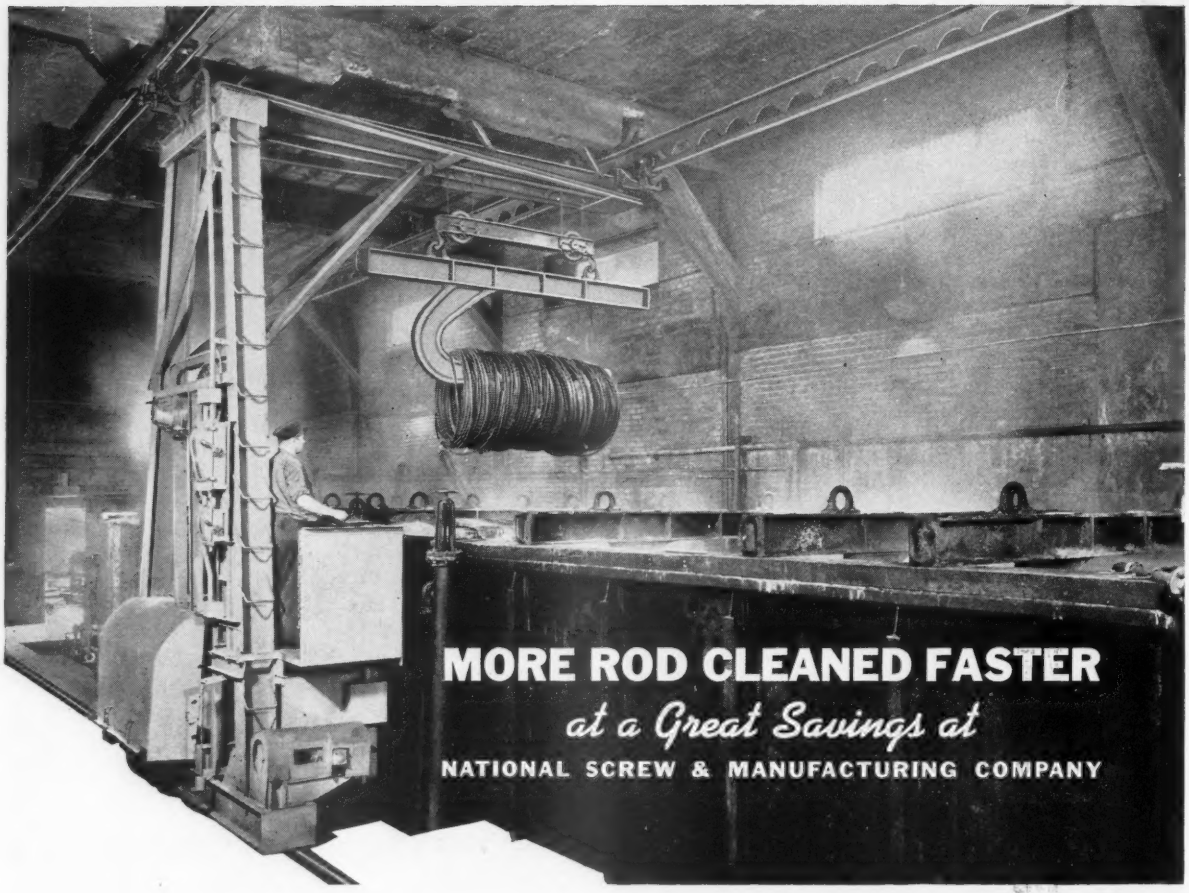
There is a third, an even more important reason: Notable improvements in furnace design made in recent years, in which F. E. I. have played a leading part. These advances already have proved of great importance to iron and steel mills in tonnage production of rods, wire, coiled strip, flat sheets, tin plate and shapes.

*Performance Records* on the latest and most advanced types of F.E.I.-engineered equipment is especially valuable to production men interested in obtaining better results from their old equipment, or in keying furnace performance to new production objectives. These performance records are yours for the asking.

**FURNACE ENGINEERS, *Inc.***

***Foreign Representatives*** { FOR CANADA: Salem Engineering (Canada) Ltd. Toronto, Ont.
FOR EUROPE, ASIA, AFRICA: Salem Engineering Co. Ltd., Milford, Nr. Derbey, England.

1551 WEST LIBERTY AVENUE ★ PITTSBURGH, PA.



# MORE ROD CLEANED FASTER

## *at a Great Savings at*

## NATIONAL SCREW & MANUFACTURING COMPANY

In the summer of 1941 the National Screw & Manufacturing Co., Cleveland, installed a Cleveland Tramrail Cleaning House Gantry Crane in the same building that long had been used as their cleaning house. The equipment was erected over a week-end and ready Monday morning without interrupting the production schedule.

The installation has proven highly successful. More rod is cleaned faster with approximately two-thirds of the man-hours of labor formerly required. Eight 300-pound, 48-inch O. D., coils are handled as a unit load through the cleaning line. The layout consists of two four-pin rubber-lined acid tubs, a combination high pressure water spray and rinse tank, a lime tub and a flash baker, all set on the floor for easy maintenance. All operations through the cleaning and baking cycle are handled by the operator of the gantry crane.

A straight cleaning house layout with a Cleveland Tramrail gantry crane requires less space, **enforces** cleanliness, orderliness, and better working conditions, all at a lower cost per ton of rod cleaned.

*GET THIS BOOK!*

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

**CLEVELAND TRAMRAIL DIVISION**
THE CLEVELAND CRANE & ENGINEERING CO.
1175 East 283rd St. Wickliffe, Ohio

**CLEVELAND TRAMRAIL**
**OVERHEAD MATERIALS HANDLING EQUIPMENT**

# *Are you Satisfied . . . . .*

## *. . with present wet wire drawing results?*

Why not let our Engineers collaborate with you in conducting tests at your convenience for improving your die-life and finish, and increasing production over your present wet wire drawing operation? If you will write us, we will gladly arrange for samples and service. Address —

Standardize with Standard

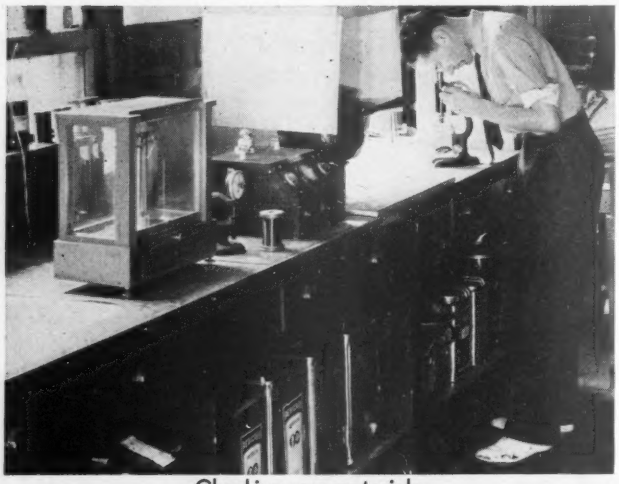
**STANDARD INDUSTRIAL COMPOUNDS COMPANY**

**4600 W. Ferdinand Street, Chicago 44, Ill.**

Standardize with Standard

Custom built spools for high speed winding

Mercury testing for continuity of film



Checking raw materials

# Don't "fool around"... USE DEPENDABLE WIRE PRODUCTS!

**A product, too, is only as strong as its weakest part. Follow the practice of leading designers and engineers by specifying only service-giving wire . . . wire that has built up a reputation for "delivering the goods under fire."**

**Hudson Wire products, designed for discriminating manufacturers, has just such a reputation in the fine wire field. Offering greater flexibility and tensile strength, perfect laying at higher speeds, new coating methods and reduced coil dimensions without sacrificing electrical values, Hudson Wire products will probably lower your production costs considerably. Check these three points:**

**QUALITY** — **All phases of manufacture, from ingot to final processing, are carefully supervised and fulfilled in the same manner you would carry out in your own plant. There are no unimportant phases in the work.**

**UNIFORMITY** — **By mercury process tests, our engineers can guarantee perfect uniformity in wire; from the smallest to the largest order. No more variations in consistency, structure or electrical properties . . . every inch of wire exactly as specified, more than meeting your requirements.**

**SERVICE** — **If you have a wire problem, our complete design and engineering facilities are at your disposal without obligation. Send your specifications and blueprints for our recommendations; or if you are not quite ready, write for samples of these quality products.**

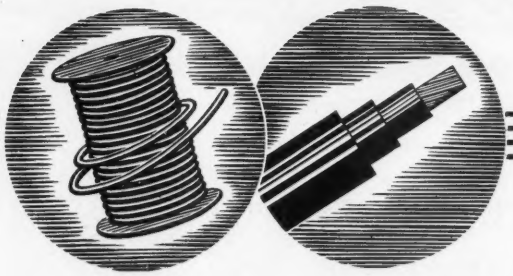
**Enameled Copper, Enameled Iron, Enameled Alloy, Enameled Aluminum, Silk Covered, Cotton Covered, Celanese Covered, Glass Fibre Covered, Twisted Multiples, Parallel Multiples, and Litzendraht**

**HUDSON WIRE CO.**

*Winsted Division*

WINSTED CONNECTICUT

# SPECIALIZED RESEARCH EXPERIENCE



In All Types of Insulating Finishes and Impregnating Materials.

All Formulations made to individual specifications and to meet unusual requirements.

Our Hot-melt, Flame-resistant Compounds are non-toxic.

**STANDARD VARNISH WORKS**

*Engineers of Product Finishes*

**NEW YORK - CHICAGO**

**SERVING INDUSTRY FOR 75 YEARS**

# JLE WIRE MARKING MACHINE

## IT'S *Four Times Faster* THAN

## ANY MACHINE ON THE MARKET!

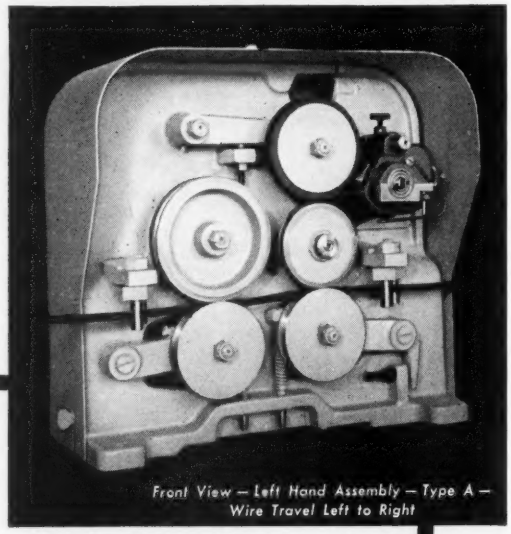
***Will Run at Speeds Up to 1000 Feet Per Minute!***

**TYPE A** *(shown right)* • For use in printing or striping on one side of wire from 1/16" to 3/4" in diameter.

**TYPE A-2** • For use in printing or striping in any one color on one side of wire from 1/2" to 2" in diameter.

**TYPE B** • For use in printing or striping in any one color on two sides (180° apart) of wire from 1/16" to 1/2" in diameter.

Machine is operated by the moving wire, thus eliminating the problem of synchronizing the machine speed and the wire speed.



*Front View — Left Hand Assembly — Type A — Wire Travel Left to Right*

## INK INFORMATION • *available colors*

Pink, Red, Orange, Yellow, Light Green, Dark Green, Light Blue, Dark Blue, Purple, Tan, Brown, White, Black, Silver, Gray.

**TYPE 100 INK** ***(All Colors)*** • For use in printing or striping in all colors on rubber and synthetic rubber compounds. For use in printing in all colors except black and purple on cold thermoplastics.

**TYPE 100F** ***(All Colors)*** • Same as 100 — but much faster drying.

**TYPE 100W** ***(All Colors)*** • For use on any compound over which a coating of hot wax is applied immediately after printing.

**TYPE 200 INK** ***(All Colors)*** • For use in printing in black and purple on cold thermoplastics. For use in striping in all colors on cold thermoplastics. Not particularly resistant to high concentration of ultraviolet light in hot, moist atmosphere.

**TYPE 300 INK** ***(All Colors Except Black and Purple)*** • For use in printing or striping in all colors except black and purple on cold thermoplastics. Very resistant to high concentration of ultraviolet light in hot, moist atmosphere.

**TYPE 300A INK** ***(Black and Purple)*** • For use in printing or striping in Black and Purple only on cold thermoplastics. Very resistant to high concentration of ultraviolet light in hot, moist atmosphere.

**TYPE 800 INKS** • For use in printing or striping on hot thermoplastics.

**TYPE 400 CLEANER** • For use in cleaning only, all inks from reservoirs, type strips, transfer rolls etc.

**TYPE 500 THINNER** • Should be used to thin type 100, 100F and 100W inks only.

**TYPE 600 THINNER** • Should be used to thin type 200, 300 and 300A inks only.

**TYPE 700 THINNER** • Should be used to thin type 800 inks only.

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JLE Wire Marking Machines are licensed under the following patents. Schake, No. 1,958,717 and Phillips, No. 2,186,555.

Ink Reservoirs are patented under No. 2,312,053 and No. 2,232,274. Other patents are pending.

**COMPLETE CATALOG SECTION ON REQUEST**

## JAMES L. ENTWISTLE CO.

**43 CHURCH STREET, PAWTUCKET, RHODE ISLAND**

***World's Leading Manufacturer of Spark-Testing Equipment***

**Chicago Office: Room 447, Monadnock Bldg., 53 West Jackson Blvd., Chicago, Illinois. British Associates: General Engineering Co., Ltd., Bury Road, Radcliffe, Lancs., England. Canadian Representative: The A. R. Williams Machinery Company, Limited, Toronto, Ontario.**

# NEED WIRE?

## You can get it in Alcoa Aluminum

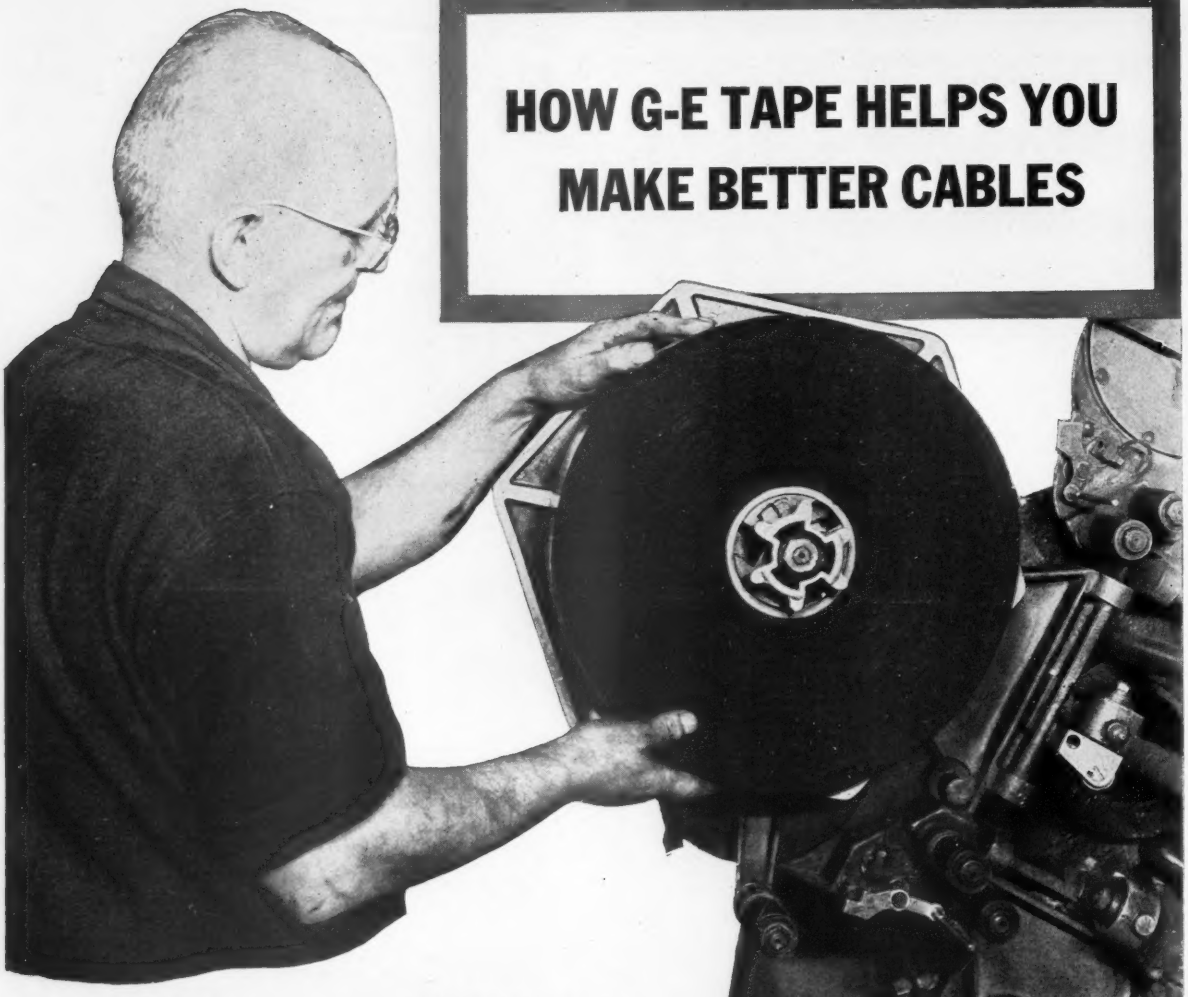
There *is* a bright spot in the supply picture. If you need wire you can get it in Alcoa Aluminum. Available in standard alloys and tempers.

Aluminum Company of America, 1828 Gulf Building, Pittsburgh 19, Pennsylvania. Offices in principal cities.

ALCOA FIRST IN ALUMINUM

IN EVERY COMMERCIAL FORM

# HOW G-E TAPE HELPS YOU MAKE BETTER CABLES



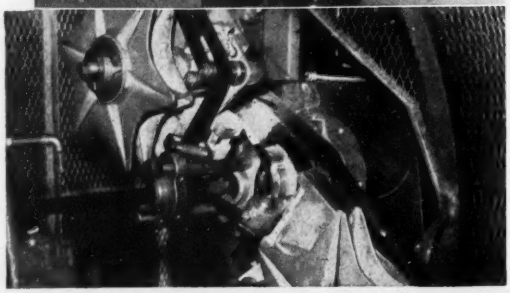
● There's no "guess work" in making G-E Cable Tape.

The basic cotton cloth must meet rigid specifications to conform to G-E standards. It is given a minimum of sizing to permit maximum varnish impregnation.

The varnish is laboratory tested to help insure maximum resistance to abrasion, heat, oil, water, and other damaging agents.

No G-E tape is just coated. The scientifically blended varnish is squeezed into the fibres of the cloth by heavy rollers. This pressure application insures a thorough impregnation. A constant temperature of 100F keeps the varnish at an even viscosity and results in a soft, pliable finish that is adhesive but not tacky. Huge drying ovens kept at a controlled temperature give the tape a thorough baking. Final tests determine the high dielectric strength, the mechanical strength, and the exceptionally low power factor. All G-E tapes must be up to or exceeding I.P.C.E.A. specifications.

General Electric also specializes in making insulation tapes to manufacturer's specifications. For complete details write to Section RIMA-WP1, Resin and Insulation Materials Division, Chemical Department, Schenectady, N. Y.

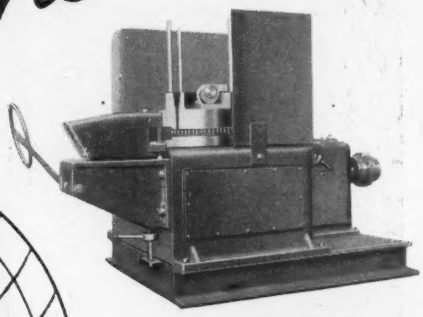


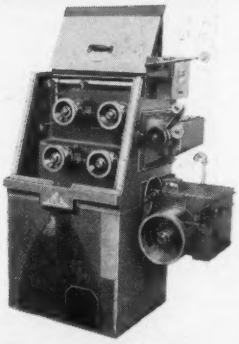
*Machine for wrapping varnished cloth tapes on cable.*

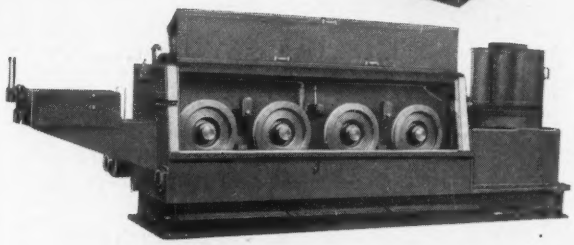
GENERAL ELECTRIC

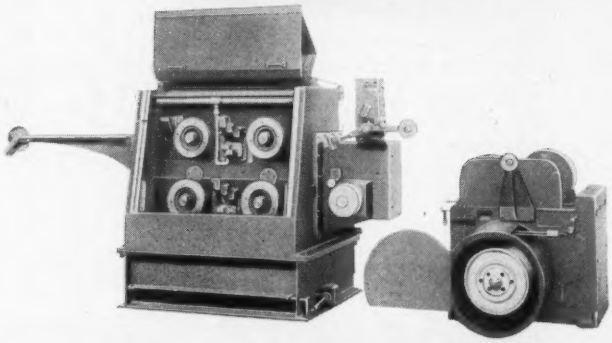
CD46-T4

# SYNCRO *Serves the World!*









THE Wire Drawing and Allied Equipment selected for installation in mills half way round the world must be dependable, simple and substantial enough to eliminate all need for factory servicing.

The constantly increasing volume of SYNCRO Equipment that is meeting these requirements in highly satisfactory operation abroad is your assurance that when you select SYNCRO, you get the utmost dependability and rugged simplicity. You also get many exclusive time and money saving features that enable you to step-up the production of high quality wire or cable.

Your inquiry for specific information will receive prompt attention.

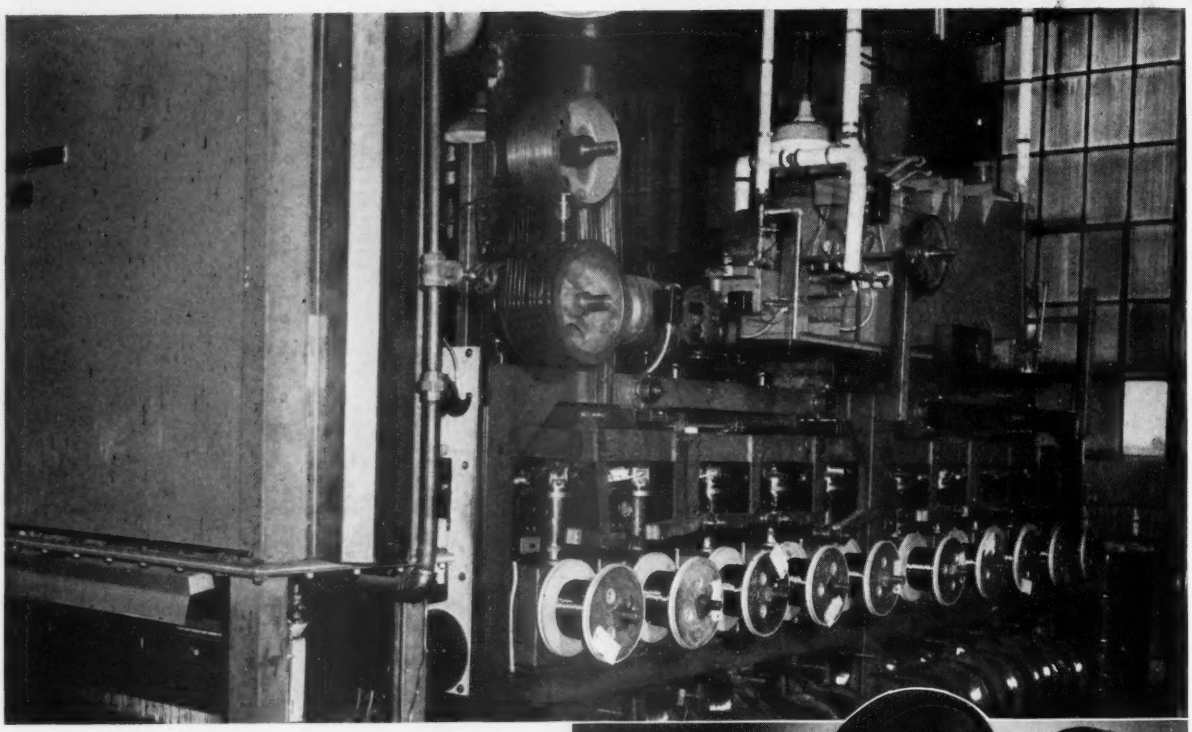
**SYNCRO MACHINE COMPANY**

REPRESENTED IN CANADA BY
CANADIAN ELEVATOR EQUIPMENT CO.
TORONTO

EXECUTIVE OFFICES AND GENERAL WORKS—611 SAYRE AVENUE, PERTH AMBOY, N. J.

*Machinery for the Wire Industry*

SYNCRO



## strong . . . chip proof

### FOR BETTER SPOOLING AND SHIPPING

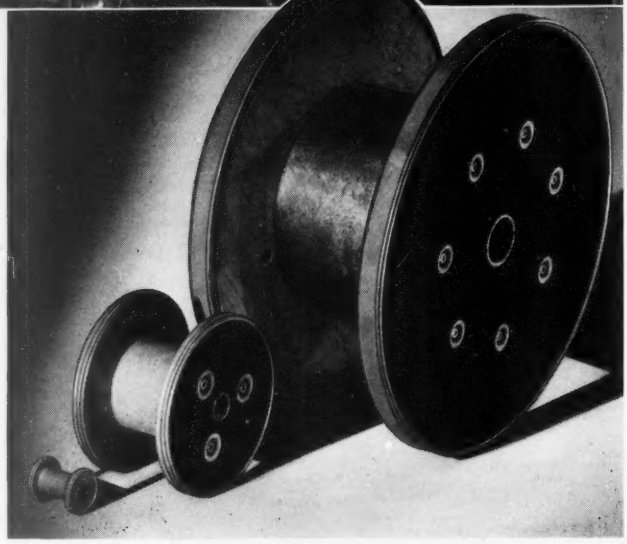
Hubbard metal-bound spools and reels are ruggedly built to meet the most exacting spooling requirements.

In the operation illustrated above twenty No. 19 copper wires are processed at one time. Installed at the Belden Manufacturing Company, Chicago, Illinois, this single machine anneals and applies six coats of a new synthetic insulating material to each wire. Final step is winding the processed wire on Hubbard metal-bound-reels for shipping. Each reel shaft is turned by an individual motor, with RPM automatically controlled for even tension throughout the spooling operation. Approximately 80 lbs. of wire are wound on each reel.

In the above application Hubbard metal-bound-reels help to assure proper spooling and guarantee safety in shipment. Write to Hubbard for information on spools and reels of every type for every application.

**HUBBARD SPOOL COMPANY**

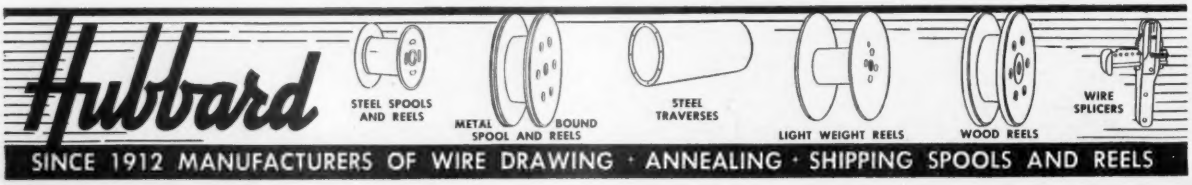
1624 Carroll Avenue • Chicago 12, Illinois



## HUBBARD

### METAL-BOUND SPOOLS AND REELS

Manufactured in every head, traverse, and barrel dimension. Heads made of wood, with or without inside sheet steel facing; steel tire on reels is die-formed around head to increase strength and provide maximum life. Barrel made of wood staves or steel. Send us your spool or reel specifications for quotation on price and delivery.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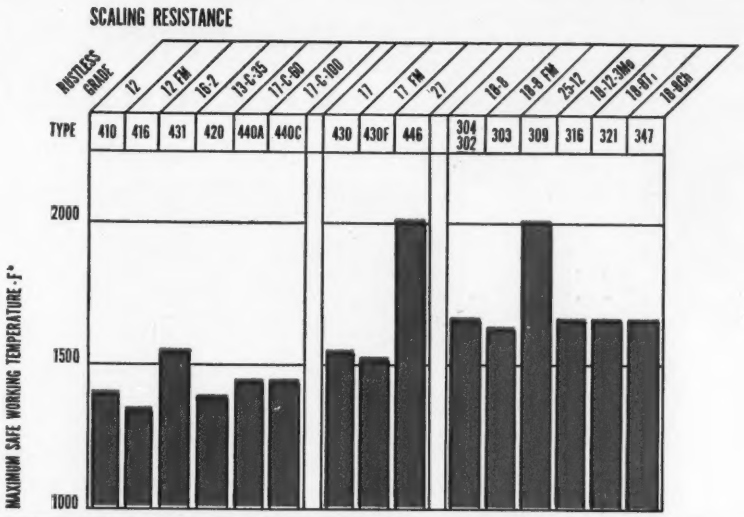
RUSTLESS DATA SHEET NO. 5

# Corrosion Resistance Plus Resistance to Scaling at High Temperatures

## One of the Many Combinations of Properties Offered by Stainless Steels




IN A SENSE, corrosion, oxidation and scaling are all the same. Scaling or oxidation is merely an accelerated form of corrosion taking place at high temperatures. Each produces the same result—reduction of the effective body of a part with consequent reduction in its physical strength and performance. The continuous performance of stainless steels at high temperatures in highly corrosive atmospheres is responsible for their extensive use in heat exchangers, industrial furnace supports, domestic stove and heater parts, valve stems, valves, torch heads on cutting and welding equipment, exhaust stacks, jet and gas turbine parts for aircraft.

Stainless steels, like other materials, vary in their resistance to corrosion and high temperature scaling. The above chart was prepared from data obtained by heating polished samples in ordinary slightly oxidizing furnace atmospheres, using circulating air as in the case of electric furnaces. It indicates that alloys lower in chromium, such as Types 410 and 416 (12% chromium) resist scaling up to approximately 1400°F. Higher chromium and high chrome-nickel grades such as Types 446 and 309 (25-27% chromium) withstand the withering effects of 2000°F. Ordinary steel scales at about 900°F. Thus, the remarkable property of stainless steel is that when the chromium content is increased, resistance to scaling is increased. Type 446 (Rustless 27) should be used for high temperature service only when stresses are low; whereas Type 309 (Rustless 25-12) can be used when conditions require high tensile strength combined with resistance to scaling and corrosion.

At high temperatures most commonly used metals and alloys form weak, porous scale which flakes off, opening the way for progressive deterioration. Stainless steels are different. Scale is tough, impervious, and strongly adherent, and offers protection against further attack. When you want to know more about the properties of stainless steels at any temperature . . . ask the leading specialists in stainless steels . . . call on Rustless.

If you have been confronted with a confusion of trade names of various stainless steels and would like to relate all producers' commercial designations with standard AISI type numbers, government specifications, and ASTM standards, write for Rustless' handy chart entitled, "TRADE NAMES OF STAINLESS STEELS."

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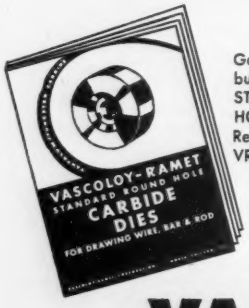


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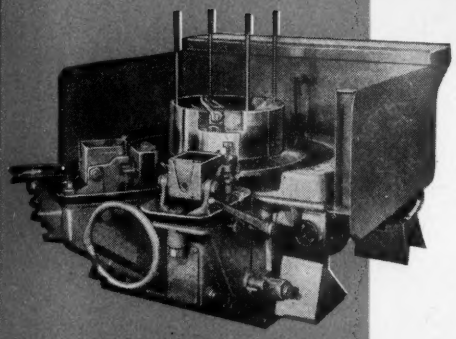

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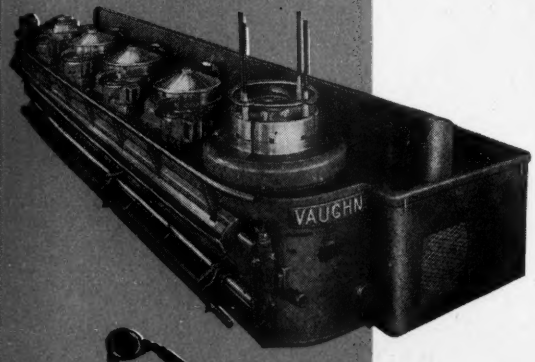


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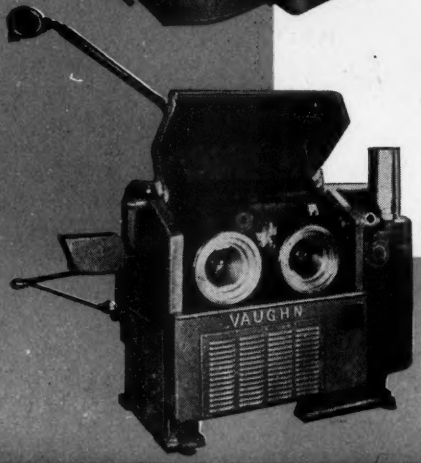


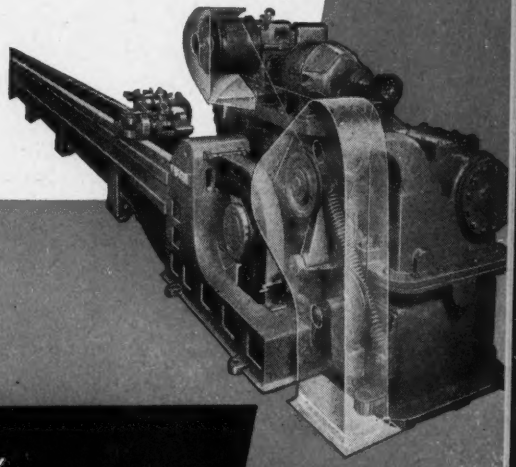

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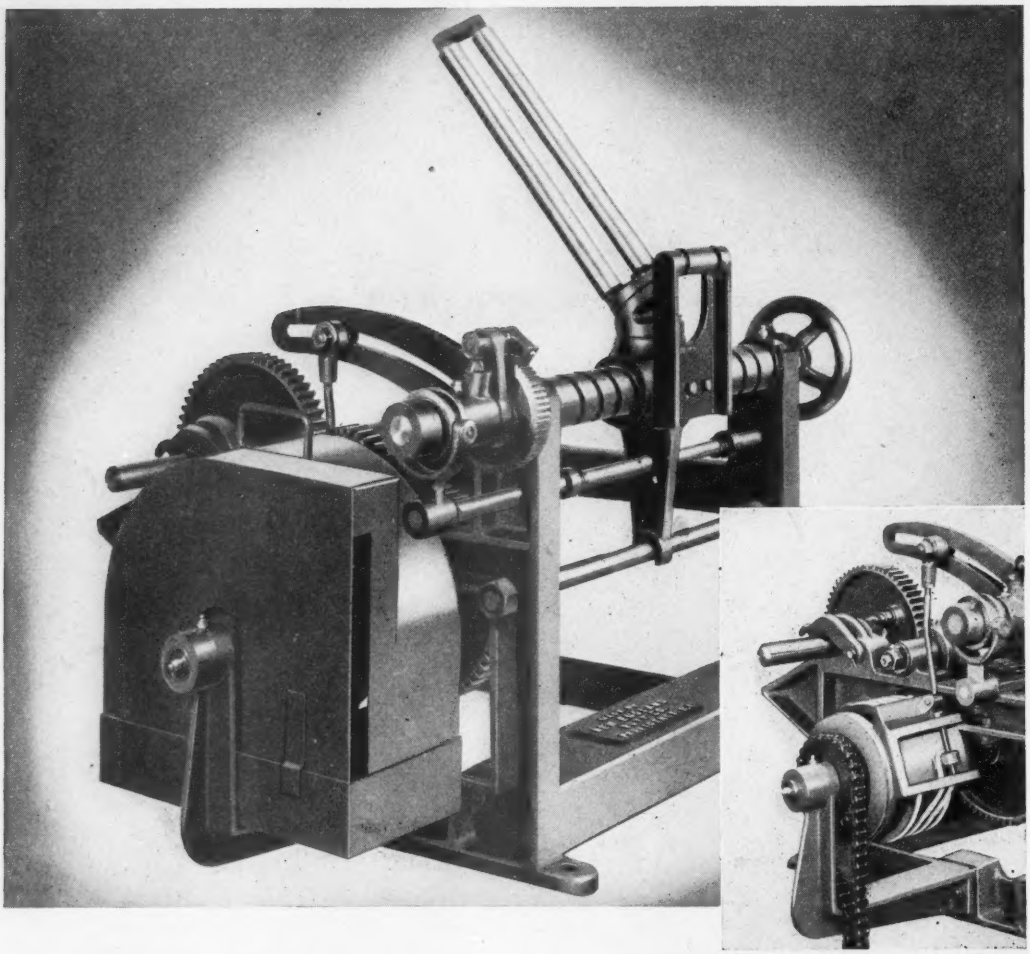

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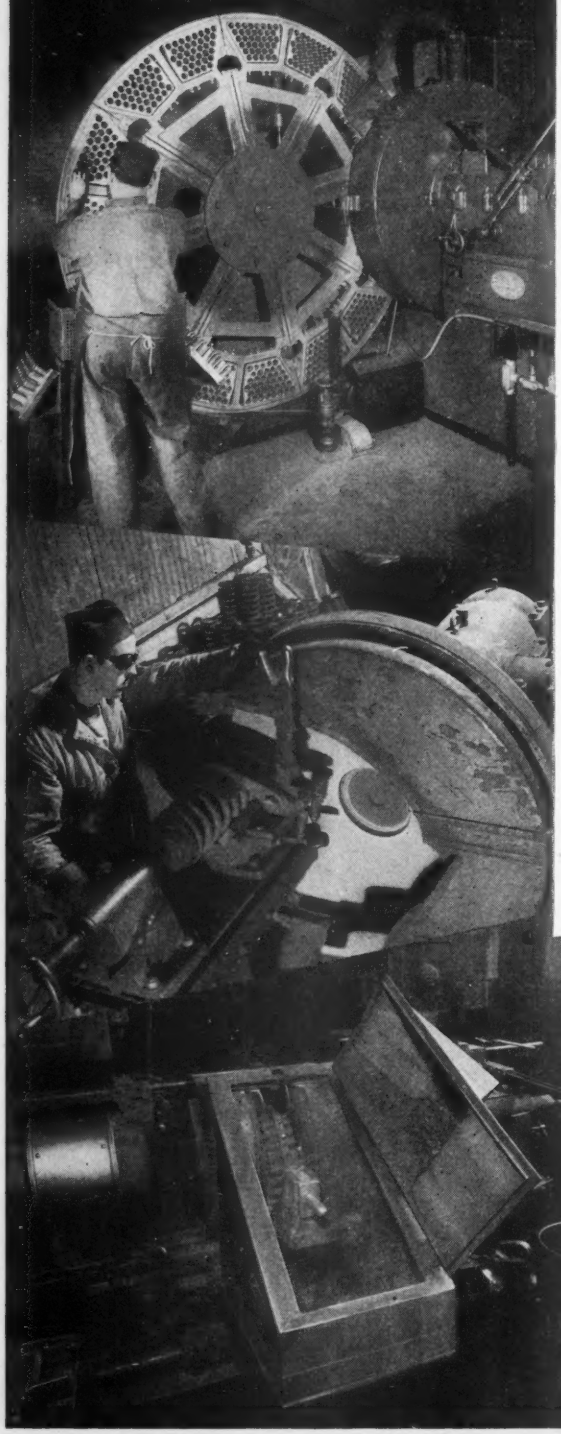

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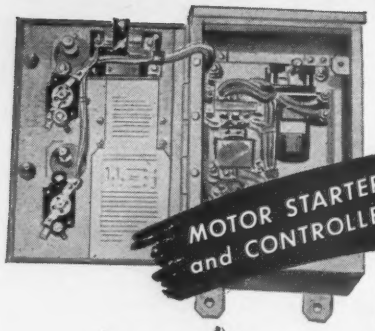


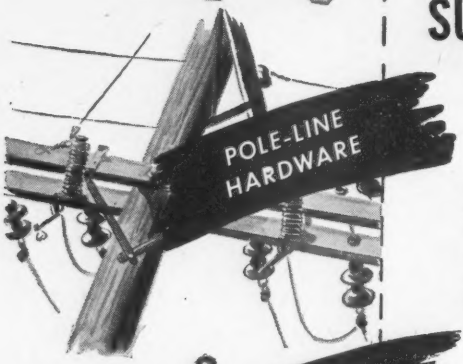


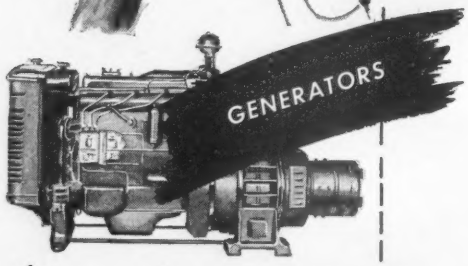


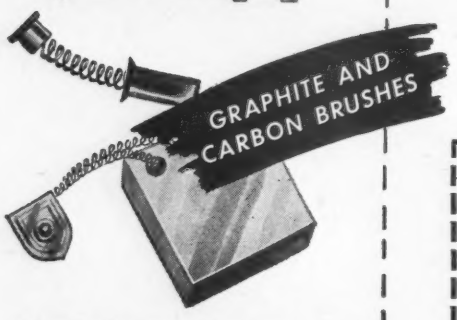


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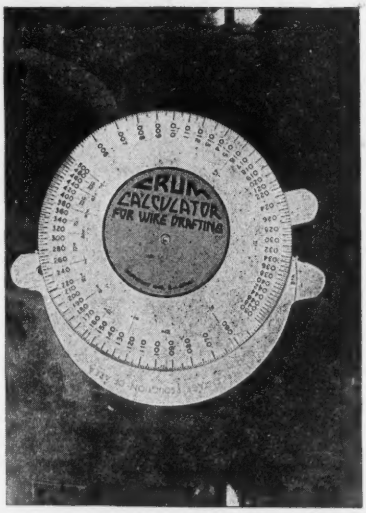
# The Crum Calculator for Wire Drafting

Provides answers simply and accurately for a given mathematical wire drafting problem. One setting shows number of holes, percentage of draft per hole, total reduction in area and intermediate die sizes to be used. Covers drafting range of .500″ to .005″. Accurate enough for most mill conditions.

* * *




Simple to operate; compact enough to carry in vest pocket; can be used for Metric as well as English systems; all diameters given in decimals. A handy and time-saving device that will eliminate time-wasting and possible errors in calculations.

* * *

## EXAMPLES OF PROBLEMS SOLVED QUICKLY BY USE OF THE CALCULATOR

PROBLEM No. 1

DETERMINE the reduction of area in drawing ¼-inch diameter rod to .120 inch wire.

PROBLEM No. 2

SUPPOSE that in Example 1 the tensile strength of the stock is such that the drawing process produces a tensile strength of 100,000 pounds per square inch in the .120 inch wire. To develop the same tensile strength in an .080 inch diameter wire, what stock size is required when the tensile strength of the stock is assumed to be the same as that in Example 1.

PROBLEM No. 3

IN the drafting of .0625 inch diameter wire to .025 inch, no single draft must exceed 21 per cent. Determine the minimum number of holes for this job.

* * *

THE Crum calculator is designed especially for wire drawing jobs involving eight or fewer drafts. Problems involving a greater number of drafts can be solved, however, with extra manipulation. For instance, if it is desired to set up a multi-draft machine to draw .0095 inch diameter wire from .0625 inch stock in sixteen drafts, the intermediate die sizes can be determined by the calculator.

PROBLEM No. 4

A CERTAIN five-block continuous wire drawing machine has a capacity permitting a draft of 33 per cent per hole on low carbon wire. For economic reasons it is desired to find the largest stock size that can be used when finishing .0455 inch diameter wire on this machine.

* * *

PROBLEM No. 5

A continuous machine is to be set up to draw .0375 inch tire bead wire six holes from .122 inch diameter stock. All drafts are to be equal in percentage reduction of area. Determine "a" the intermediate die diameters; "b" the per cent reduction of area per hole; "c" the total per cent reduction of area from start to finish.

PROBLEM No. 6

THE diameter of the finishing block of a double-deck wire drawing machine is twenty-four inches; the diameter of the first block, seventeen inches. The operator wishes to finish .142 inch diameter wire from No. 5 rod and therefore must determine (a) the minimum draft for the finished die, (b) the minimum first die size, (c) and the first die size when a slippage of ten per cent is allowed.

* * *

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# The Wire Outlook

Since the bituminous coal strike ended, industry has staged a substantial comeback and is operating at the highest levels of the year, the gains being principally in steel ingot production.

The ending of some of the copper stoppages has improved the non-ferrous outlook, although weeks will elapse before the effect of new production can be realized, especially in the manufacture of electric wire, where limited rolling capacity will continue to be a bottle-neck for months to come. The vital need of the moment is motors, lack of which is holding up the delivery of much badly needed production equipment.

Substantial quantities of merchant wire are being produced, enough to meet pre-war levels, but falling far short of amounts needed to satisfy the huge consumer demands accumulated through the war years. More nails, fence wire, bale ties and spring wire are greatly needed, and the growing demands on the steel mills will require much new equipment — added wire drawing, nail, barbed wire and wire forming machines, as well as rolling equipment and additional steel making capacity, to meet the unprecedented demands; it will take several years and millions in new capital investments to effect these installations. Nail requirements for this year are estimated at 795,000 tons, with 835,000 needed for 1947. Of this, the Veterans Housing program alone will absorb 560,000 tons in these two years.

Copper and brass products cannot be expected to approach normal until late this year. 125,000 tons of copper was lost to production through strikes, which was offset by the importation of 30,000 tons, not all of which will find its way into wire.

The death of the O.P.A. should serve as a spur to the production of lead and zinc as well, indeed, as many other items. Prices have risen and will continue to advance, but are unlikely to go beyond reason. Every large producer of goods knows that uneconomic advances have the effect of narrowing markets; if there is one thing that the big corporation needs, after a price schedule that will permit it to remain in business, it is a market broad enough to insure the absorption of its goods.

Prices bear heavily on the ability of a market to buy. Even should a new price control agency be brought into existence, it is more than likely that its controls will not be as far-reaching nor stifling as those of the defunct bureau.

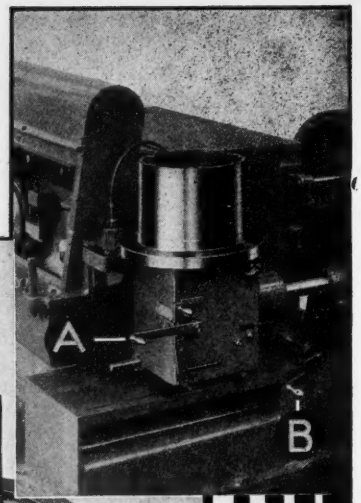
Its principal concern should be with those items that do not even begin to approximate a supply-and-demand balance, like housing.

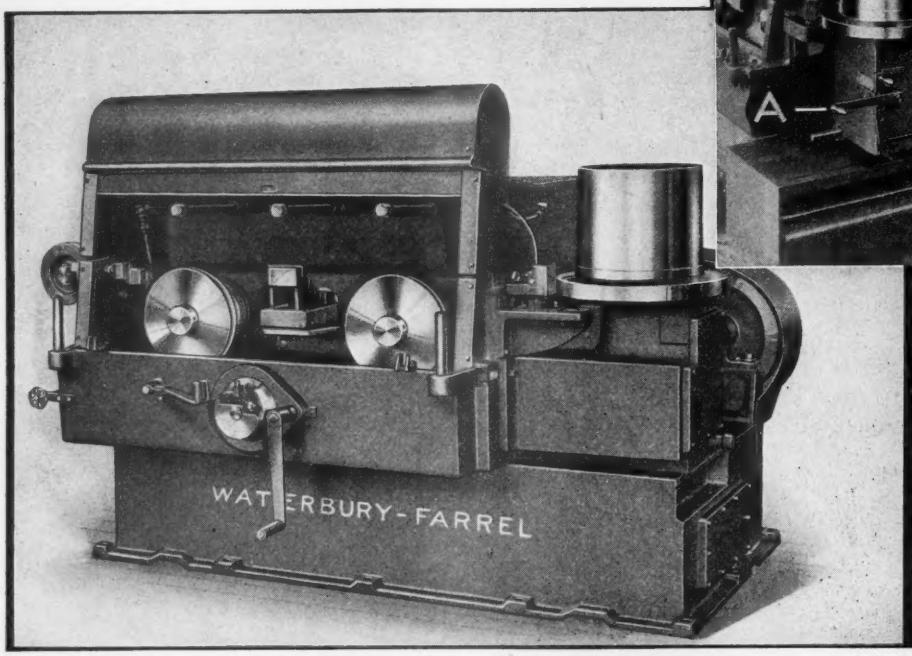
Price adjustments are not ended by any means. If freight rates advance 25%, as requested, new prices will have to be figured, the net result of which will be to leave labor worse off than before their leaders began the cycle of work stoppages to pressure the Government and industry into accepting their demands. If labor leadership were wise and honest, it would devote its energies to a good housecleaning of its feather bedding rules and regulations, to the end that the output per man-hour may be increased, thus helping to reduce unit costs of production and prices. In this manner only can its members hope to stretch the purchasing power of their "take-home" pay.

The future looks brighter and will continue to improve, unless labor has learned nothing and its tactics are repeated.

*—from the Editor's Desk*

# WIRE DRAWING MACHINES

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Upright Cone Continuous Machines with provision for quickly changing the rotation and position of block.

Two conveniently located removable handles do the trick in jig time—

**A — changes direction of rotation**
**B — shifts position of block . . .**

*The machines are available with blocks of various diameters or with spooling devices. Our wire drawing machinery is described in Catalog W.*

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DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 21 AUGUST, 1946 No. 8

Designated as
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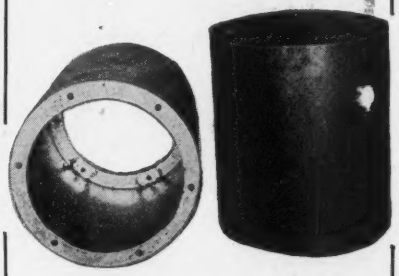

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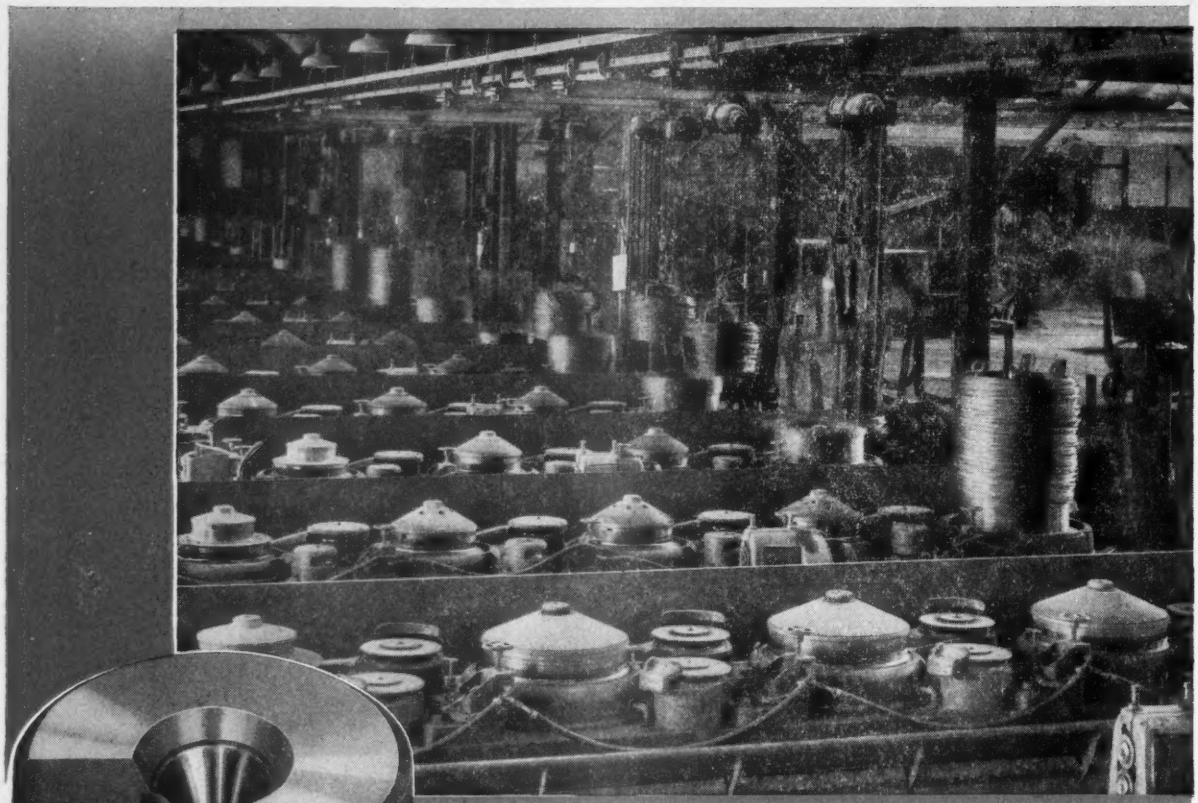
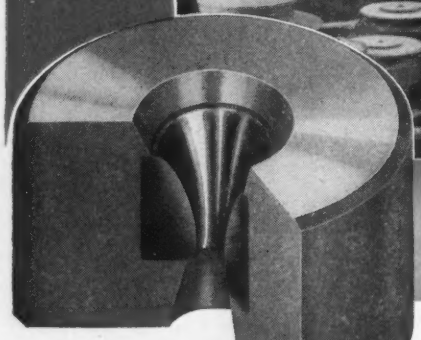


*Photograph of Wire Mill courtesy of The Vaughn Machinery Co.*



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# Salt Baths in the Wire Industry

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Portchester, New York

A Study of Salt Bath Heat Treating for wire and wire products together with a discussion as to the determination of profitable methods.

## Introduction

THIS article was written with the hope that it would stimulate interest in the heat-treatment of wire in salt baths. Every effort has been made to point out the disadvantages as well as the advantages so that anyone contemplating the use of salt baths may be in a better position to determine whether this method has application to his particular requirements. To be of enough value to replace existing equipment the quality of the heat-treated wire must be superior to that already produced, or the same quality must be maintained at appreciably reduced costs.

* * *

SALT bath heat-treating may be applied to almost all wire heat-treating applications, but the processes must be scrutinized carefully to determine which of them are profitable and which are unprofitable. From the standpoint of quality, salt bath heat-treatment is unexcelled for certain applications, but will be inferior to present methods in others. The solutions to the problems require close cooperation between the metallurgist, chemist and furnace engineer so that satisfactory work is done at a minimum cost. The economics of the process depend greatly on fuel and salt cost, and the cost figure of heat-treatment by the more commonly used equipment. Salt bath heat-treating may be very economical under certain operating conditions.

* * *

IN recent months there have been some new developments in salt baths which may materially enhance the desirability of these processes. Descaling baths have been developed which operate in heat-treating temperature ranges so that descaling and heat-treating may be combined into a single operation, a desirable circumstance. These baths also prevent the formation of scale so that process material may be heat-treated bright and scale free. In both instances, handling and labor costs are reduced so that these practices may compete economically with present methods.

* * *

THE following are some wire mill processes for which salt may be used:

1. **Double salt patenting of process wire scale free.**
2. **Double salt patenting and descaling of rods.**
3. **Subcritical annealing and descaling.**
4. **Spheroidizing of rods.**
5. **Bright annealing stainless wire.**
6. **Simultaneous annealing and descaling of stainless steeels, and non-ferrous heat resisting analyses.**

* * *

BEFORE discussing these processes in detail it will be advantageous to cover furnace equipment and salt baths in a general way.

* * *

## Furnace Equipment

THE furnace equipment, of course, varies considerably with the purpose for which it is to be used.

HERBERT H. SCHNEIDER, Metallurgist
Russell, Burdsall & Ward Nut & Bolt Co.
Portchester, New York

There are certain features which are more or less common for all applications.

* * *

WHERE neutral baths are to be used one may use an iron, alloy or ceramic pot. For high temperature work, say 1400° F. or higher, it is very advantageous to use a ceramic lining. Neutral baths are chlorides which are corrosive to steels at these temperatures resulting in short pot life. Ceramic linings may last 7 or 8 years and even longer when operated in the 1500° F.-1600° F. range. With ceramic linings electric heat by immersed electrodes is used. Certain types of baths attack the ceramic lining so that an iron or alloy iron pot then is used. These may be heated by gas, oil or electricity. However, electric heating is advisable since all the heat is generated within the bath making for longer pot life, more efficient heating and very close control or temperature.

* * *

THE transformer capacity required is easily determined. The KW for the work including fixtures

$$= \frac{\text{weight in lbs. per hour} \times \text{temperature rise} \times .12}{3412}$$

To this value is added the KW for top radiation taken from charts which often is several times the work value and the side radiation. The size and spacing of the electrodes are determined from experience. The transformers may be two phase, three phase, or three to two phase. There should be enough reserve so that the furnace temperature may be raised rapidly when required.

* *

RECENTLY a prominent furnace manufacturer developed an electric salt bath furnace not employing the conventional vertical electrodes at the one side of the furnace. This would be very advantageous in wire operations, particularly in reducing the bath surface which should materially reduce the eletcric cost.

## Salts Used and Some of Their Properties

NEUTRAL salts which are mostly chlorides may be used for most wire mill applications. Since several wire mill processes involve the transfer of work from one bath to another, the question of contamination arises. With the proper selection of salts this is no problem. In the double salt patenting of wire, the melting point of the transformation bath is obtained by adding a second salt to the composition of the high temperature bath to obtain a low temperature melting point. Therefore no contamination occurs, since it is only necessary to replace the dragout with the proper chemical and the correct melting point is maintained. In the annealing and spheroidizing of bolt rods, the temperatures of both baths are easily in the useful range of a single salt, so there is no contamination.

* * *

IN spite of all allegations to the contrary, salt baths fume. This becomes excessive when the baths are operated at too high a temperature. It is advisable to equip the furnaces with hoods or to provide some means of suction near the baths to take care of the fumes.

* * *

THE so-called neutral baths often do decarburize, the tendency increasing with higher temperatures and longer times. The time interval is too short to do any harm in wire heat-treating except in shperoidizing or similar practices. This is minimized with proper rectification and should cause no difficulty. If the bath becomes contaminated with sulfur bearing oils it may become decarburizing. It is possible to check chemically in a few minutes whether the bath has a tendency to decarburize, so that no great supervision is required. It is interesting to note that one prominent manufacturer of salt baths advertises a self rectifying bath. Presumably with such a bath there would be little or no danger from decarburization.

* * *

SLUDGE is formed by the breakdown of the bath, by the introduction of foreign material carried into the bath by the work, by overheating and by rectification. In a ceramic lined furnace the salt may get in back of the heat resisting brick and attack the rammed backing up material, causing sludging.

* * *

ANOTHER important property in wire applications is the ability to completely remove the salts from the wire surface after the heat-treatment is completed. Most salts are corrosive to metals and must be removed to prevent future troubles. The neutral baths being principally chlorides are very soluble in water and are easily washed off. Care must be exercised when transfer quenching is done so that no insoluble products are formed which may be difficult to remove. Occasionally some additions are made to neutral baths which are not soluble in water and are difficult to remove. These baths should be avoided in wire processes.

* * *

## Descaling With Molten Salt Baths

SALT baths are very effective in descaling various analyses in certain temperature ranges. The descaling is brought about by simply immersing the work in the molten bath and is to be distinguished from various other methods such as the electrochemical, low temperature caustic soda or sodium hydride methods.

* * *

THE chemical salt bath descaling may be heated by gas or electricity, and the bath slowly loses its descaling property with time and the amount of work descaled. The baths are easily rejuvenated by the addition of special compounds and they are then as effective as a new bath.

* * *

THERE is a cyanide containing bath which melts at about 650° F. and is very effective in descaling straight carbon analyses in the range of 1000° F. to 1200° F. The action is much stronger at the higher temperature levels and with increased time. At 1200° F. an average number 5 hot rolled rod may be descaled in

as little as 6 minutes. The time interval is considerably shortened when the work is quenched from another bath from a higher temperature. This bath may be used to simultaneously anneal and descale rods in batch form.

* * *

THERE is another bath consisting principally of alkaline earth chlorides which melts about 1400° F. which is very effective in descaling stainless steel and non-ferrous chrome nickel alloy rods. This bath may sometimes be operated successfully as low as 1650° F. but is much more effective at 1700° F. At 1850° F. to 1900° F. it descales austenitic stainless hot rolled rods in as little as three minutes, and the non-ferrous (80% Ni-20% Cr) in as little as six minutes. The resulting surface is usually very smooth and bright.

* * *

HOT rolled rods of carbon spring analyses can sometimes be completely descaled during double salt patenting by chloride baths. This is really a mild descaling action, and for most applications it would be advisable to have a 20 second dip in acid after the patenting operation.

* * *

## Double Salt Patenting of Process Spring Wire

THIS process employs two electrode ceramic lined furnaces. One furnace is used for austenitizing the wire and has a top operating temperature of about 1700° F., and the other is used to transform the austenite with a top temperature of about 1100° F.

* * *

THE strands of wire are passed continuously through the high temperature and transformation baths, through a water wash tank, a lubricant tank, drying zone and on to the take up reels. The wire may then be taken to the drawing frames for further drafting. If lime is used some provision must be made for quickly drying the lime. Where it is desired to use one of the new developments making lime unnecessary, a hot air blast to dry it is sufficient. It is possible to have the equipment in line with galvanizing equipment so that process wire may be patented and galvanized continuously, and the wire sent to the wire mill for further cold reduction if required.

* * *

THE above process has many advantages over the double lead patenting method providing certain design precautions are observed which will be discussed later. A schematic comparison of double lead patenting is interesting as shown here.

**DOUBLE SALT**

1. **Wire transported to patenting unit.**
2. **Wire patented, limed and dryed continuously.**
3. .....
4. .....
5. .....
6. .....
7. .....
8. **Wire transported to wire will.**

**DOUBLE LEAD**

1. **Wire transported to patenting unit.**
2. **Wire double lead patented.**
3. **Wire transported to pickle department.**
4. **Wire Pickled.**
5. **Wire is hosed and may be given alkali dip.**
6. **Wire is dipped in boiling lime solution.**
7. **Wire is baked.**
8. **Wire transported to wire mill.**

Operations 3 and 4 completely eliminated by this method of salt patenting, while 5, 6 and 7 are done continuously without additional labor or handling. From a production standpoint this is ideal.

* * *

BEFORE making a more detailed examination of the cost comparison of the two methods, a few details necessary for successful operations will be discussed. It is a well known fact that a lead bath cools wire a great deal faster than salt, particularly when the wire is being quenched into a salt bath from another salt bath. This is probably true even if the transformation bath is highly agitated. To produce the same tensiles in a salt bath it is necessary to operate the transformation bath 50° F. to 75° F. lower than lead. The distance the wire must travel after its exit from the first bath until it is submerged in the second, is also very important. If the wire is in the air six feet between baths travelling at 30 feet per minute, the wire would be in the air 12 seconds. In sizes around 12 gauge or smaller, this is too long for ordinary spring analysis, and the structure may be partially transformed before it is immersed in the transformation bath. This will result in low and non-uniform physical properties. Indeed, in special cases where a .35 to .40 carbon, low manganese is run the austenite may almost be entirely transformed between the furnaces. Since a thin film of salt is carried out of the high temperature bath which slows down the cooling rate of the wire, it is possible that with this practice the tensile strength of the double salt patented wire will be lower than an air patented wire, much to the annoyance and consternation of the plant metallurgist. The distance the wire travels in air between the baths, therefore, should be a maximum of 3 feet and preferably two feet. This may be accomplished in a properly designed unit.

* * *

SPEED of travel of the wire is important from several standpoints. The faster this wire travels, the shorter is the interval of time between furnaces.

* * *

ELECTRICAL cost is a major factor. The higher speed favors lower electrical costs since the bath surface area may be held at a minimum for a given tonnage. More than 50% of the electrical cost is due to heat dissipation by radiation. Since the radiation for a given temperature is constant, it is advisable to make the pots small and run the wires as fast as metallurgical considerations permit.

* * *

WHILE units may be built to operate at higher temperatures than 1700° F., the electrical power requirements go up rapidly due to the increased radiation losses. Also the ceramic lining and the electrodes have a greatly reduced life. It should not be necessary to exceed 1600° F. to 1625° F. for good results.

* * *

A chloride salt bath maintained around 1600° F. to 1650° F., definitely does not act as a lubricant for wire passing by a sinker bar. It is better practice to use only one "sinker" or "depressor" bar in the high heat furnace to avoid serious abrasion of the wire. The "depressor" should be located so that the

wire passes by it at as low a temperature as possible. When this precaution is taken, no difficulties should be encountered for these reasons. It is difficult and impractical to maintain rollers in such a bath due to the corrosiveness of the bath. In any event, only alloy compositions offering maximum resistance to salt attack should be used.

* * *

PROBABLY no other single item has a greater effect on the success of the process than salt cost. Salt consumption is principally due to sludge, fuming and drag out. Salt drag out increases rather rapidly as the speed of travel is increased over a certain value and as the diameter of the wire decreases. When there is no provision for salt recovery, these factors may make the process entirely uneconomical. For example, running .082 wire at 30 feet per minute, austenitizing temperature of 1600° F., and transformation bath at 750° F., the salt consumption was 70 to 75 lbs. per ton of wire. This figure was secured in actual operation during the patenting of approximately 200 tons of wire. At a salt cost of 10 cents per pound, this cost was prohibitive. In actual operation, thirty pounds per ton were added to the high heat bath, and forty to the low. This figure probably could be broken down as follows: 8 lbs. per ton in sludge in high heat, 5 lbs. lost in fumes, 17 lbs. dragged into low temperature bath. Since 40 lbs. per ton were actually added, it follows that approximately 57 lbs. of salt per ton were being dragged out. Since the wire was immediately quenched in water, this was lost. It is possible to install a mechanical salt recovery system which would salvage about 2/3 of this, leaving a net salt loss of 25 lbs. to 30 lbs. per ton of wire. Keeping these various factors in mind, we are now prepared to make a fairly good cost comparison between double salt and double lead patenting. We will assume the cost of electricity is 3/4 cents per Kilowatt hour, and a salt cost of 6 cents per pound.

Considering a unit patenting one ton per hour, 168 tons per week or 8736 tons per year, the savings would be 23,587 dollars annually.

**COST COMPARISON PER TON**

| Double Salt Patenting | | | Double Lead Patenting | | |
|---|---|---|---|---|---|
| Electric Cost | 250 KW | 1.50 | Gas | | .75 |
| Salt Cost | 30 lbs. | 1.80 | Lead | | 1.25 |
| Cleaning Cost | | none | Cleaning Cost | | .4.00 |
| | | 3.30 | | | 6.00 |
| Metal loss due to scaling | | none | ¾% or 65 tons | | $3900 |
| Metal loss due to pickling | | none | ½% 43 tons | | 2580 |
| Reduction in scrap and rejections due to close temperature control | | none | 1% 87 tons | | 5220 |
| | | | | | 11,700 |
| Ceramic Pot replacements and electrodes, on yearly maintenance | | 1,200 | 3 pots | | 1,500 |
| | | | labor | | 1,500 |
| | | | | | 3,000 |
| Net 1,800 dollars in favor of salt. | | | | | |
| Floor space | | 1000 square feet at 3 dollars | | | 3,000 |
| Net advantage for double salt yearly | | | | | 23,587 |
| | | | | | 11,700 |
| | | | | | 1,800 |
| | | | | | 3,000 |
| | | | | | $40,087 |

The investment pays for itself in a few months time.

* * *

AN important consideration of the salt bath treatment is the electric cost for down time. It might seem that by allowing the temperature to drop so that a crust forms on top, the radiation losses would be cut down to a very low figure. This is not entirely true. In fact, one unit which required 250 KW to process 1200 lbs. of wire per hour, used about 175 to 200 KW hours to idle over the week end. This with the power required to bring the baths up to temperature added considerably to the cost. This is partly due to the fact that when the two baths are in operation, considerable KW is being brought into the low temperature bath, and when the unit is not in operation, the current will be on longer in the transformation bath. The amount of KW being brought in the low temperature bath for two 2000 pounds per hour unit would be:

$$\frac{2000 \times 600 \times .12}{3412} = 42 \text{ KW}$$

The 600 is the difference in °F. between the temperature of the furnace and the work.

* * *

THERE is no doubt that there are definite quality advantages in double salt patenting. The immersed electrode type of heating keeps the temperature within 5° F. This close control of temperature makes for very uniform physical properties not only throughout a coil, but from coil to coil.

* * *

THE elimination of the acid picking has a decided effect on wire quality, particularly for music and rope wire. There is no danger of decarburization because of the short immersion time, and no carburization because neutral salts are used. Since there is no scale formed and no acid to remove scale, the surface is much smoother resulting in better die life. Cold reduction improves the surface finish. By this process one has in effect as far as finish is concerned, a fine wire drawn directly from the rod.

* * *

THE heating rate of salt baths is very rapid, 2 to 4 times as fast as in muffle furnaces, although it is probably not as fast as lead. It was found that a .128 round wire of .20 carbon and 1.75 manganese which

(*Please turn to page* 615)

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# A Review of Inhibitors

## PART II — U. S. INHIBITOR PATENTS

By Wallace G. Imhoff, B.A., B.S., M.S., Met. E.,
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**FOREWORD:**

A very exhaustive search through the patent literature reveals a hazy, disconnected, and seemingly unrelated list of patents which today are classified as inhibitor patents. So little was known about the scientific and technical phases about the art of pickling before 1900, that almost all thought and effort was devoted to inventing pickling machines and equipment, and there does not seem to be any reference, or any evidence that the action of inhibitors was known, or even the word "inhibitor" used in the meaning that it is today, in pickling practice.

* * *

THAT there was no related or connected thought on that phase of pickling practice is shown by the many different names used for discussing the different things that were described in the pickling literature, and which today has been gathered together when reviewing the progress and the development of modern inhibitors. As a typical example of what we mean the following names are found in the literature — "Promoters", "Restrainers", "Addition Agents", "Pickle Regulators", "Restraining Agents", "Organic Controlling Agents", "Inhibitors", and in the Plating Industry "Brighteners".

* * *

ALL of these are discussed in a more or less unrelated manner at first, then with an apparent suspicion that they are related, and finally they are all gathered together converging to the one focal idea of removing the scale, but protecting the steel base, and the material used is called an "inhibitor".

FOREWORD

This review of Inhibitors was presented before the Wire Association Meeting in San Francisco, California, on June 7th, 1946.
The author's object in presenting this review is First to summarize all the work done by others on this subject and Second to attempt to explain clearly what he says takes place when Inhibitors are used in acid pickling baths.

THE few very early patents and discussions were not related at all to the modern idea or viewpoint of inhibitors, but rather to the effects and influences of certain metals and their behavior in acid solutions. That the facts discussed were related to, or had any bearing on inhibitors as we know them today in pickling practice was not known. Pickling was in its early stages of development a very disagreeable work in industry, and the use of such early materials as flour, fermented yeast, etc., in the pickling bath was for the purpose mainly of reducing and holding down the choking disagreeable pickling fumes developed during the cleaning of the steel for further processing. These early practices were matters of self preservation, rather than scientific research.

* * *

IN reviewing the subject of inhibitors today we find "high-lights", or "mile-stones" at various points along the way which have an unusual, or vital importance on later developments and discoveries. One of these "mile-stones" is the early patent granted to Aiken and others in 1883. It was granted to Aiken and Others, and refers to "Wire or Metal Cleaning Bath", U.S. Pat. 288,150. It relates to the addition of metallic cyanide to the pickling solution, which increases the efficiency of the acid. It also prevented acid brittleness, and shows that some thought was being given to bettering the pickling process and conditions, and improving the quality of the product.

* * *

IN his paper, "The Use of Inhibitors in the Pickling of Steel", Douty calls attention to a paper by A. Meurice in 1896 in which he records that certain grades of acid were more suitable than others for pickling of wire, and that arsenic was found in very large quantities in the good acid. The same author also calls attention to two patents in 1900 to Robinson and Sutherland on pickling baths containing starchy substances such as bran extract, flour, etc. These materials have almost no "inhibiting, or restraining power", but were used mainly to keep down the acid spray, and the fumes from pickling. A little later, 1905, Charles Burgess of the University of Wisconsin reinvestigated the effect of arsenic and noted that it reduced acid brittleness in watch springs. According to Douty the influence of arsenic was first discovered by E. Millon in 1845, and was actually patented in 1908. He also states that prior to 1907 materials suggested for such use included alcohols, mannite, resorcinol, and hydroxy-substituted compounds in general.

* * *

BY this time evidently investigators knew, or had the thought that there were materials, which

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**Part I — Section A — Review, June 1946**
**Part I — Section B — Review, July 1946**
**Part II — U. S. Inhibitor Patents, Aug. 1946**
**Part III — Bibliography, September 1946.**

when put into the pickling bath would have the beneficial result of allowing the acid to dissolve the oxides and scale, and yet minimize the action on the base metal, while at the same time tending to reduce acid brittleness. It appears that the action and even the materials which could be used, were not understood. This fact is shown by a further discussion by Douty, which we quote in full because of its great importance to the story of inhibitors and their discovery and development.

* * *

"IN 1907 (the writer first started to work in the wire galvanizing department of The American Steel and Wire Co., Rankin, Pa., in June 1906) appeared the first important series of patents bearing on the use of extracts of various organic substances, the active ingredients of which are invariable heterocyclic bases containing quinoline nuclei, the most active of which are of high molecular weight. C. Laverty's patent which appeared in that year covered the use of pickling baths containing extracts of hydrocarbons, which, in the light of his specification, meant extracts of waste tars, particularly from the oil industry. These materials, the oil sludge of refineries, contained, of course, all of the basic nitrogenous constituents of petroleum, which Mabery and others had shown to consist largely of bases with heterocyclic nuclei. Laverty did not know what were the active ingredients in his material, but there is no doubt that his valuable empirical discovery stimulated investigation which led to the subsequent identification of the substances responsible for the effect."

* * *

IN carefully reviewing the literature and the patent files very little material is to be found from 1900 to 1920. In reviewing the patent literature we note that in 1917 a patent on the use of the waste liquor from the manufacture of sulphite paper pulp as an addition to pickling baths, was taken out by Drehfahl. In 1917 and 1918 Hoffman took out three patents for the same purpose. These materials formed an excellent foam blanket over the pickle bath, but the inhibiting value is very low. A heavy white frothy foam blanket over the bath eliminates the choking fumes and acid vapor that result from the pickling action, and also formed in stripping baths.

* * *

THE action of formaldehyde on the inhibiting action of pickling baths was noted by Roger Griffin in 1920, and in 1923 Holmes patented the use of aldehydes as addition agents to pickling baths. As late as 1926 a patent was taken out on the use of dry, evaporated waste sulphite liquor in pickling baths. In 1922 and following the Vogel patents were taken out, and covered various preparations made from coal tar, crude anthracene, etc. According to Douty the credit goes to Vogel as being the first to announce in his patents the nature of the active ingredients of this class of inhibitors, and he also states that this is the first really valuable commercial inhibitors of which we have record. These were the nitrogen ring type inhibitors.

* * *

ONE of the most powerful inhibitors was discovered by Schmidt in 1926. It belonged to the sulphur-bearing class, thioamides, and particularly thioureas. These patents were known as "the Newport Patents", and had the most important success as commercial inhibitors. By 1927 and 1928 the race to discover the hundreds of organic materials that have been used as inhibitors followed. The past twenty years from 1926 to 1946 finds the patent literature filled with patents covering various kinds and classes of organic materials numbering up in the hundreds. The following list gives the record of some of the most important of these patents.

* * *

## RECORD OF INHIBITOR PATENTS

| YEAR | PATENT |
|---|---|
| 1883 | Aiken, Benjamin F., and others. Wire or Metal Cleaning Bath. U. S. Pat 288,150. Use of cyanides in preventing acid brittleness. |
| 1900 | Robinson, Chauncey E., and Sutherland, William L. Picking baths containing startchy substances, such as bran extract, flour, etc. U. S. Pat. 640,491. |
| 1907 | Laverty, C. Covers the use of pickling baths containing extracts of hydrocarbons from waste tars, particularly those of the oil industry. U. S. Pat. 856,644. Consists of sulphuric acid and a hydrocarbon oil. |
| 1917 | Drefahl, Louis C. Metal-Pickle and Method of Pickling. U. S. Pat. 1,191,291. Acid pickling bath is mixed with approximately 6 per cent of cellulose pulp waste, so as to form a thick foam on the solution. |
| 1917 | Hoffman, Addison F., and Parkin, W. M. Process of Pickling Metal Articles. U. S. Pat. 1,221,735. Neutralized Waste Sulphite Liquor is added to acid to form a blanket of foam on the liquor and prevent the escape of acid spray. |
| 1918 | Hoffman, Addison F. Pickling-Bath and Method of Making the same. U. S. Pat. 1,225,956. Pickling solution formed of equimolecular proportions of sodium chloride and sulphuric acid. |
| 1918 | Crabbe, Henry J. Pickling Compound. U. S. Pat. 1,268,818. Mixture for making pickling solutions for treating castings or other metal articles, is composed of 1 part sodium chloride and 2-5 parts sodium acid sulphate. |
| 1920 Feb. 24, | Craue, Louis J. Picking Material; Nitre Cake, Sumac Leaves. U. S. Pat. 1,331,866. |
| 1920 Dec. 13, | O'Brien, William G. Process of Making Thioureas. U. S. Pat. 1,482,317. |
| 1922 | Vogel, Otto. Art of Picking Metals. U. S. Pat. 1,433,579. |
| 1923 | Vogel, Otto. Pickling Bath and Process for Pickling Iron and Steel. U. S. Pat. 1,460,395. Pickling Bath composed of Sulphuric acid or other acid, containing one per cent of quinoline or another of its derivatives to prevent the metal from becoming brittle. |
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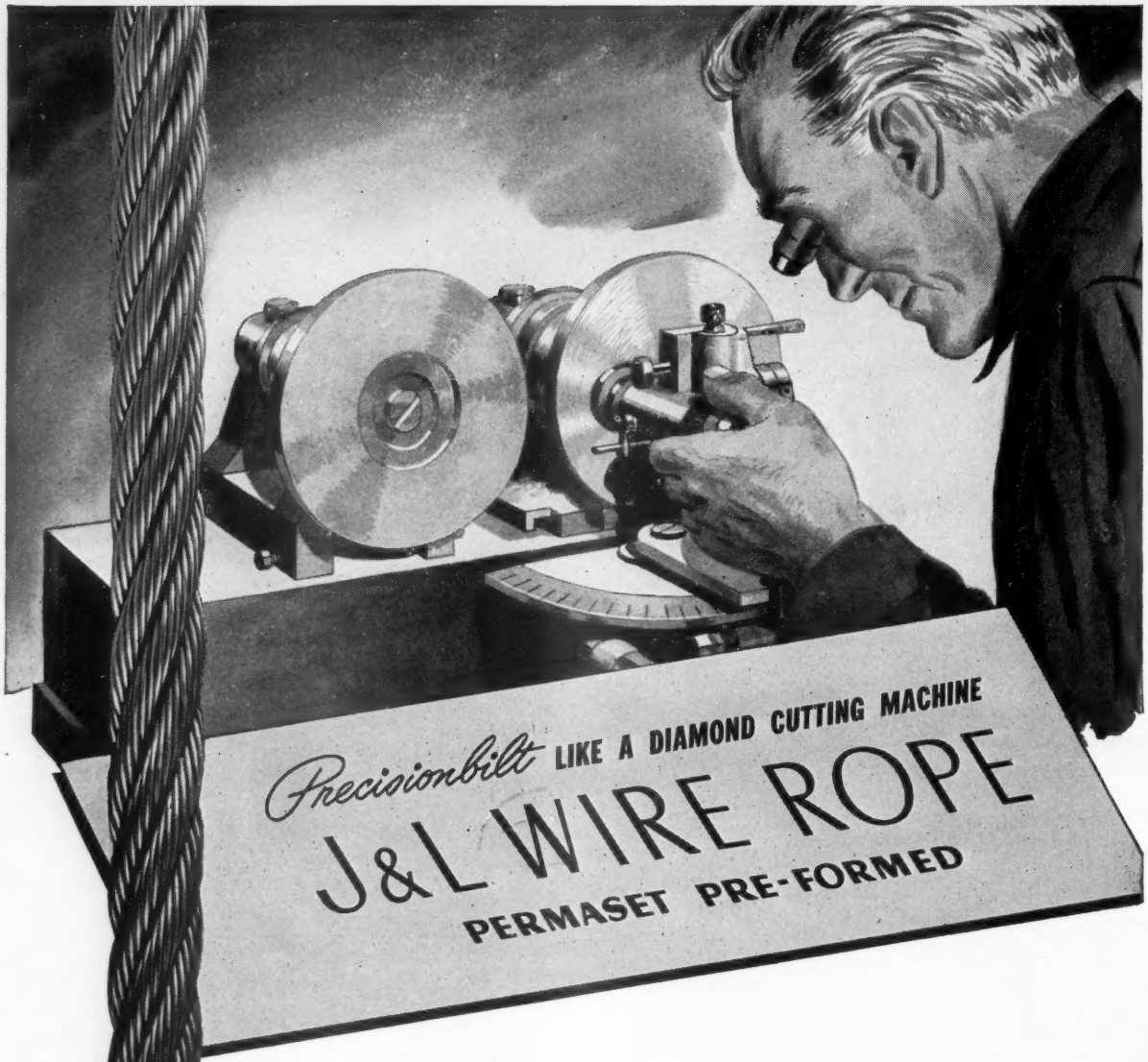
(*Please turn to page* 621)

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**PITTSBURGH 30, PENNSYLVANIA**

**J&L *Precisionbilt* PERMASET PRE-FORMED WIRE ROPE**

# The Extrusion of Plasticised Polyvinyl Chloride Compositions

By E. L. Midwinter

(From "British Plastics", Vol. 17, No. 191, April, 1945, pp. 161-170, 181).

A timely treatise on Plastics of today from an English viewpoint.

## Basic Design and Function of an Extruder

THE machines used for p.v.c. compositions are similar to ordinary rubber forcers, and consist of a horizontal "barrel" inside which a screw or "worm" rotates. At one end of the barrel there is a hopper for feeding the plastic to the worm, and at the other end the head is bolted in position. The head is hollowed out to form a chamber which at first follows the line of the barrel and then gradually tapers and turns through an angle, usually of 90 deg., until it emerges at the front of the head, where an extrusion die is fixed.

* * *

FROM the back of the head, a pencil die or "torpedo" enters and extends to the extrusion die. The torpedo is fixed at the back of the head and is supported at the die end by three or four set-screws or a perforated annulus seated in the head. The purpose of the torpedo is to guide the wire through the head to the die orifice and, when the torpedo point and extrusion die are accurately centred with respect to each other a concentric layer of plastic can be extruded over the wire, which is pulled through at a constant rate.

* * *

TO maintain the p.v.c. composition in a state suitable for extrusion the barrel, head and die are heated by steam, oil or electric elements. A water bath about 6 ft. in length is usually provided to cool the covered cable before it is wound up.

* * *

THE mechanical forces built up within an extruder are very considerable and the construction must be such that pressures are equally distributed. The main casting, which should withstand 90 lb./sq. in., is usually of cast iron, and the sleeve of hard high tensile steel, preferably of stainless type. The screw, because it is supported only at the drive end, and is subject to great stress, should be of very high grade hardened steel. Even a very slight misalignment causes wear, since the clearance between the barrel and screw should never be more than about 5 thousandths of an inch.

* * *

THE torpedo should have a detachable tip or point of hardened metal, preferably tungsten carbide. Soft points wear quickly, due to abrasion by the conductor, which may be drawn through at rates of 18,000 yards per hour. A worn point gives too great a clearance over the conductor and prevents accurate centering.

* * *

ALL parts of the extruder should be stream-lined, since undercuts, unnecessary projection or ridges result in "dead spots" where plastic may lodge and remain stationary for long periods. Surfaces which contact the plastic must, therefore, be smooth and hardened. Ordinary chromium plate on the sleeve, screw and head is inadvisable, since the plating may chip off. Other surface plating processes have, however, been used and found very satisfactory.

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ON entering the machine the plastic is moved forward by the rotating screw and makes contact with the heated walls of the barrel. As a result of the work done by the screw, heat is generated within the material. Thus as the temperature is raised the p.v.c. moves forward in an increasingly plastic state until it is in the form of a soft, homogeneous dough. Fresh compound entering the barrel causes the soft material to flow smoothly round the head-turn and torpedo, over the conductor and out of the die.

* * *

THE amount of heat generated by mastication depends not only upon machine design but also on the hardness of the particular compound being used. Assuming a standard set of conditions, mastication of a hard compound will generate more mechanical heat than a softer compound containing more plasticsers which act, in some measuse, as lubricants and reduce the amound of internal friction. It does not follow, however, that because less heat is generated by more highly plasticised compounds, extra heat has to be supplied by heating the machine itself. Highly plasticised compounds can usually be satisfactorily extruded at lower temperatures than harder compounds.

* * *

## Temperature Control and Its Effects Upon Production

OPTIMUM temperature conditions are those which give a covered cable free from surface irregularities and allow high production rates to be maintained over long periods. At high temperatures

there is a risk of decomposition, especially if the material is allowed to remain in the machine for abnormally long periods.

* * *

CORRECT gradation of temperature at different parts of the machine is exceedingly important. The degree of softness of the plastic must increase as it approaches the die, and for this reason temperatures of barrel, head and die should increase in that order. Higher temperatures on the barrel than the head cause a back flow, since the viscosity of the material in the head is then higher than that in the barrel. Thus production rates are reduced with attendant risks of decomposition of plastic due to prolonged exposure to high temperatures.

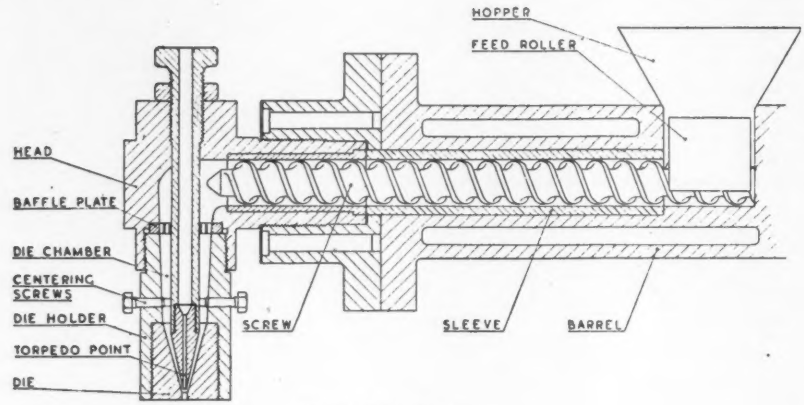


Fig. 1. General layout.

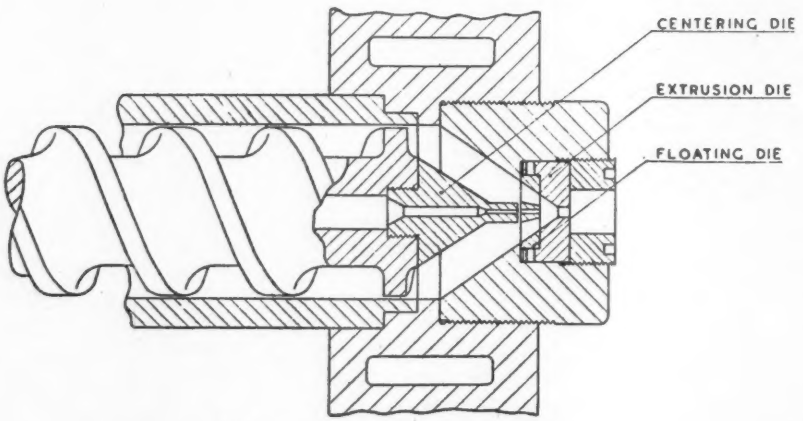


Fig. 2. Straight through wire covering head.

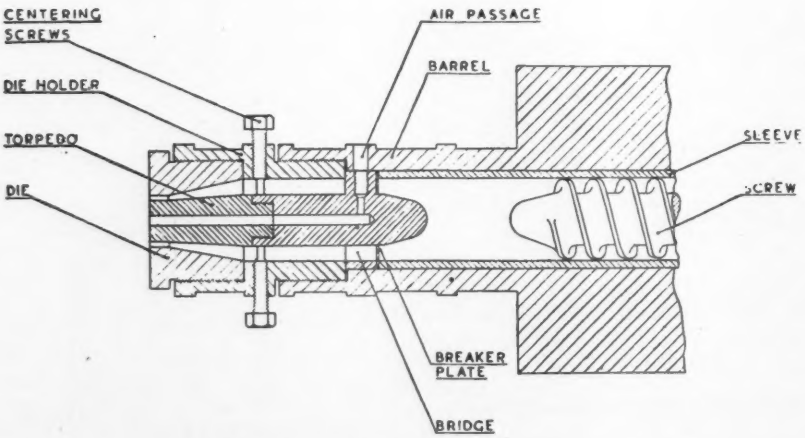


Fig. 3. Straight through head for tubing.

* * *

LOCAL hot or cold spots also disrupt flow by causing back flow and turbulence. Instead of material being directed uniformly towards the die it converges upon the walls of the machine and forms a number of eddy currents which may be transmitted to the die. In consequence the conductor is forced over to one side causing non-concentric coverings, and because of reduced effective pressure, production rates rapidly decline.

* * *

STRAINS or grain effects may be introduced into the extruded sections either if the temperature is too low, and too great a force is required to extrude the plastic, or if the temperatures are such that turbulence is created within the plastic at the die locality.

* * *

IT is not possible to quote exact processing temperatures, since these will vary, often considerably, according to the type of compound. In general, the head and die are between 130 deg. C. and 150 deg. C., while the barrel has even wider limits and may vary from no applied heat to 140 deg. C. Influencing factors are throughput of extruder, temperature of feed and extrusion pressure.

* * *

## Temperature Control of Machine

IDEALLY the temperature of the plastic itself should be controlled. In practice it is sufficient to control accurately the temperature of the various parts of the machine and to record temperatures as near as possible to the plastic stream.

* * *

TEMPERATURE measuring points should be as near to the plastic stream as possible and not on the outside of the machine. For the barrel, thermometer sockets can be

drilled in the walls, while for the head and die thermocouple leads can be let into the sockets in the metal parts. The most convenient arrangement is to have all thermocouples linked up to one control board and millivolt meter. By these means remote control can, in some measure, eliminate risks of damage to recording apparatus. For conventional machines, the temperature should be recorded at the hopper and head extremes of the barrel, one or two points along the head run depending on length, and at die as near the orifice as possible.

## Types of Feed

AN even momentary loss of feed to the barrel results in a pressure drop with subsequent reduction in extrusion rates and dimensions of extruded section. It is, therefore, always advisable to provide a slight excess of material available to the screw, the material being in such a condition that it freely responds to the action of the screw and does not clog the feed aperture.

* * *

**STRIP Feeding.**—Strip will normally be dragged into the barrel by the rotating screw, but, to increase the extent of drag, a small positively-driven metal roller may be located in the feed trap. The roller, preferably heated, rotates at higher peripheral speeds and in an opposite direction to the screw, therefore tending to build up a small reserve of plastic which rotates in the feed.

* * *

**CHIP Feeding.**—A large mouthed hopper mounted vertically above the feed-trap is satisfactory for hot or cold chips. The hopper may be jacketed and heated when hot chips are used. One disadvantage of large hoppers is that the base may get clogged and a serious misfeed result. Best results are obtained by fitting a large secondary hopper which discharges on to an inclined vibrating conveyor leading to a much smaller hopper mounted on the extruder.

* * *

## Machine Design

EVEN if recommended temperature conditions are maintained, poor extrusion will result if disturbances are introduced into the flow of plastic by poor machine design. Localised disturbances of pressure cause strains in the plastic, and if these strains are allowed to persist as the material moves forward, inconsistent extrusion will follow.

* * *

IT is principally upon the flow chambers, that is the barrel and head, that the efficient and economic working of the machine depends. For this reason they should be designed with regard to the entire process, and not as a single operation in a series of processes.

## Design of Flow Chambers

THE flow chambers should be as free as possible from obstructions and "dead spots." The effect of both the 90 deg. turn in the head and the torpedo should be allowed for by either extending the head or reducing the angle of head-turn. Breaker plates should also be fitted in the head.

* * *

EXTENDED heads act as reservoirs and damp out swirl and turbulence. They also smooth out temperature variations and assist in creating a uniform degree of plasticity as the compound nears the die. For this reason it has been found very beneficial to fit extended heads to rubber forcers in which the screw is comparatively short.

* * *

FIG. 1 illustrates a typical wire-covering head of a rubber forcer and a head design specially for p.v.c. extrusion. If an extra-long head is used it is important that the temperature be correctly graded along its length in order to maintain a forward flow of plastic and reduce risk of decomposition to a minimum.

## Y-Heads and "Straight Through" Extrusion

THE head turn, although generally 90 deg., can be reduced to, say, 60 deg. or 45 deg. The extent of uncontrolled flow is reduced and in some cases a short head can be used satisfactorily.

* * *

MACHINES have been designed for "straight through" extrusion, where turbulence, due to the plastic turning in the head, is completely eliminated. These are almost exclusively used for extruding tubes and solid sections. For wire covering the conductor passes through a ¼/⅜ in. channel, drilled axially down the screw, being led through a close-fitting centring die on the drive end and further supported by a second centring die as it leaves the tip. (Fig. 2). The conductor is then led through a third die which "floats" and is centered with respect to the extrusion die which is located immediately in line with the screw about ½ in. from the end of the floating die. Accurate temperature control is necessary for this type of machine. Long screws of 20-25 in. effective length (for 1½ in. diameter), and deep threads of small pitch are desirable to obtain homogeneity.

## Design of the Worm

THE function of the screw is to force the plastic mass forward, and this object is achieved by virtue of differential frictional forces between the plastic/barrel and plastic/screw. The clearance influencing factors are:

**(1) Speed of rotation.**
**(2) Pitch and contour of threads.**
**(3 Ratio of diameter of effective length.**

* * *

SCREWS cut with a diminishing pitch in general give increased production rates, since the plastic will be subjected to a greater pressure as it nears the end of the screw. In such cases rigid temperature control of the barrel is essential, since, if there is insufficient forward pressure at the feed, i.e., if the plastic is too hot, there will be a tendency for back flow.

* * *

THE initial pitch of the screw is important, since it provides a

(*Please turn to page* 624)

# Glycerine: Friend of the Wire Worker

By Georgia Leffingwell, Ph.D.
and
Milton A. Lesser, B. Sc.
New York, N. Y.

**The many uses of glycerine and synthetic alkyd resins made with glycerine in wire drawing and wire fabrication are described and analyzed.**

IN the specialized field of wire manufacture and wire products fabrication, glycerine and the synthetic alkyd resins made with glycerine find a number of valuable applications.

* * *

GLYCERINE, for example, may be a useful component of the chemical compositions used to remove any dirt or scale which may have accumulated on rods or wires during hot rolling. One European authority (1) has recommended the following combination for such chemical cleansing purposes:

| | |
|---|---|
| **Soda crystals** | **4 Kg.** |
| **Sodium hydroxide** | **250 Gm.** |
| **Glycerine** | **125 Gm.** |
| **Potassium manganate** | **16 Gm.** |
| **Water (hot)** | **120 liters** |

* * *

THIS worker also noted that the addition of glycerine to chemical derusting and descaling solutions greatly facilitated the removal of dirt, oil, colors and the like, without affecting the derusting action.

* * *

OF related interest is an American patent (2) describing a glycerine-utilizing method for neutralizing adhering pickling acid and inhibiting rusting. In the procedure specified, directly after pickling, metal, such as strip steel, is rinsed in a solution containing caustic alkali, glycerine, and sodium metaphosphate or hexametaphosphate. Such procedures, it is claimed, gives results superior to the usual oil methods.

* * *

WHERE tempering of wire is indicated, it is well to remember that glycerine and its solutions are particularly suitable for bridging the gap between oil and water. The observations reported by Scott (3) of the Bureau of Standards, back in 1924, have been confirmed more recently in Richards' (4) discussion of glycerine-water mixtures. He noted that the higher the ratio of glycerine to water the milder the quenching. High elasticity and maximum hardness is obtained when glycerine is the major constituent. Elasticity is further enhanced by adding ¼ to 4 per cent of potassium or manganese sulfate. Even greater elacticity is attained through the addition of 1 to 2 per cent of potassium chloride or 1 to 3 per cent of manganese chloride. With such quenching media, no acrolein is formed by thermal decomposition. No dirt or other deposits are formed and traces of glycerine are readily washed off the metal.

* * *

TO protect wire from corrosion a coating of zinc is often applied by hot galvanizing. Glycerine has found an established place as a flux-conditioner in such processes. (5). Its advantages in this connection have been discussed in detail by Imhoff. (6) He pointed out that not only does glycerine provide a medium for supplying and holding water in the flux, but it also supplies the fluidity necessary in a good working flux so that it can slip off the work easily and not burn onto it, as a dry, cakey flux usually does. In short, glycerine helps to establish good coating conditions on the work.

* * *

ACCORDING to this authority (7) glycerine has a similar function as a fluz conditioner in hot-dip tinning. Here it serves to keep the flux light and foamy. The value of glycerine is also well indicated in Daniels' (8) report on hot-tinning processes. The tinning of copper wire, he notes, is a continuous process, the wire passing successively through a pickle, water wash, flux, and tin pot. The pickle is 5 to 10 per cent sulfuric acid, used cold. Significant is the statement that the usual zinc chloride or zinc chloride-ammonium chloride solutions for fluxing are being replaced by stannous chloride and glycerine, or lactic acid, or glycerine, or by a mixture of glycerine and lactic acid.

* * *

ALTHOUGH welding is more general in modern practice, soldering still finds frequent use in the fabrication of wire products, including wire cloth, to meet specific industrial and technical needs. Glycerine enters extensively into the formulation of soldering solutions anl fluxes. (9) One rather versatile solution, said (10) to be satisfactory for brass, copper, steel, tinned steel and monel metal, consists of:

| | |
|---|---|
| **Zinc chloride** | **15.0 per cent** |
| **Glycerine** | **25.0 „ „** |
| **Water** | **60.0 „ „** |

* * *

QUITE different is a soldering solution specifically recommended (11) for soldering steel wire. This consists of:

| | |
|---|---|
| **Lactic acid** | **1 part** |
| **Glycerine** | **1 part** |
| **Water** | **8 parts** |

* * *

FREQUENTLY solder powder is suspended within the flux in a pasty medium; providing products which greatly facilitate a joining job. According to Watkins, (12) they usually consist of powdered tin or solder mixed with zinc chloride and ammonium chloride, glycerine

and water. His analysis of several soldering pastes indicates that more than 60 per cent of glycerine may be used in their formulation. Glycerine-containing pastes, he reported, were found to be "very satisfactory in practice."

* * *

UP to this point only the physical properties of glycerine have been considered. This fluid, however, is almost equally versatile as a chemical substance. Of the many reactions into which it can enter perhaps none are more important than those which result in the formation of the group of synthetic products known as alkyd resins. In the great majority of cases glycerine is made to react chemically with the polybasic acid, phthalic anhydride. Other organic acids, like maleic, succinic, and sebacic acid, are used where certain properties are desired. These reaction products are usually modified by the incorporation of oils, fatty acids, natural resins, or other synthetic resins. Thus by varying the raw materials and by the use of different modifying agents, alkyd resins may be prepared to meet the needs of numerous applications as coating, impregnating, or binding agents.

* * *

COATINGS based on alkyd resins are outstanding for their toughness, durability, resistance, elasticity, and high electrical insulating properties. Although the uses of these glycerine-containing resins have been greatly expanded in recent years, their most important applications are in the manufacture of protective paints, varnishes, lacquers, and enamels for metals. (13, 14).

* * *

A number of alkyd resins are designed specifically for use in protective or insulating coatings. In some cases, especially those described in earlier patents, (15, 16, 17) alkyds formed the sole resinous materials of the wire coats. In more recent developments, alkyds are used in conjunction with other film-forming materials. For example, in preparing netting suitable for exposure to the weather, one patent (18) specifies that the metal wire be coated with a film containing a cellulose derivative, an appropriate plasticizer and one of several suitably modified alkyd resins. In another case, (19) mixed resinous compositions suitable for coating wire are prepared with glycerine-containing alkyd resins and phenol-formaldehyde resins.

* * *

ILLUSTRATIVE of still another alkyd-utilizing material is the following patented (20) wire-insulating enamel formula:

| | | |
|---|---|---|
| **Wood rosin** | **50.00** | **parts** |
| **Alkyd resin** | **150.00** | **„** |
| **Perilla oil** | **205.00** | **„** |
| **Fish oil** | **15.00** | **„** |
| **China wood oil** | **73.50** | **„** |
| **Manganese resinate** | **0.30** | **part** |
| **Ferrous resinate** | **0.45** | **„** |
| **Cobalt acetate** | **0.25** | **„** |
| **Zinc resinate** | **1.00** | **„** |

* * *

ANOTHER interesting use for alkyd resins is given in a method for coating copper wire with superpolymide mixtures. According to the patent claims, (21) use of higher baking speeds, for the production of blackened, flexible, tightly adhering coatings, is facilitated by mixing the superpolyamides with up to about 40 per cent of specified alkyd resins.

* * *

IN some cases the excellent bonding properties of alkyd resins are called into use. In his review of the alkyds as bonding materials, Hovey (22) cites the successful use of a special flexible resin for attaching asbestos to copper wire. In a much more recent instance, (23) a combination of urea-formaldehyde resin and oil-modified alkyd resin is similarly employed to bond glass sliver to wire to form an insulated electrical conductor. This resinous combination is applied to the base wire and while the coating is still tacky, the glass sliver is attached. The resulting "wooly" wire is then dipped into or sprayed with the resin solution and passed through a baking tower to dry and cure the resin, which draws all the protruding glass fibers firmly into the film. The final product is an insulated wire having a smooth polished external surface, free from all protruding glass fuzz.

* * *

FABRICS, paper, and other sheet material used to protect and insulate wire conductors are often coated or impregnated with compositions based on alkyd resins. Varnished, electrical-insulating cambric, extensively used in making cables and related products is often prepared with alkyd resins. (24, 25) Various cellulosic materials impregnated with appropriate alkyd resins are recommended (26) as insulating wrappings for cables because of their superior dielectric strength.

* * *

THE outermost protective covering or coating on cables is often improved by the use of glycerine-formulated alkyd resins. According to an older patent, (27) an insulating and weatherproofing covering for an electrical conductor is formed of a fibrous material that is saturated with a composition consisting mainly of a mixture of an alkyd resin and drying oils. Metal powder, preferably aluminum flakes, is suspended in the composition. In another case, (28) a glycerine-sebacic acid reaction product and ethyl cellulose are used in conjunction with a lubricating agent and a fireproofing material to make a coating for special cables capable of withstanding high temperatures without loss of their effective properties. The product with such a coating is intended for use as an ignition cable for internal combustion engines. A more recent patent (29) describes a somewhat similar outer coating composition for cables. The multiple wire conductor carries a layer of rubber insulation and a fabric sheath on which is applied a flexibly, highly heat-and oil-resistant coating. This coating contains ethyl cellulose, a castor oil-modified glycerine sebacate resin, and a urea-formaldehyde resin in a combination of solvents containing other specified materials.


1) **Plucker, E.: Emailwaren-Ind. 14: No. 12, 9, 1937**
2) **Shoemaker, R. W.: U. S. Pat. 2,257,-133, 1941**
3) **Scott, H.: Trans. Am. Soc. Steel Treating 6:13, 1924**
4) **Richards, E. T.: Tech. Zentr. pfakt. Metallbiarbiet 50:568, 1940**
5) **Haarmann, R. & Radeker, W.: Stahl u. Eisen 58:397, 1938**
6) **Imhoff, W. G.: Steel 94: No. 21, 23, 1934**
7) **Imhoff, W. G.: Metal In., Dec. 1939, p. 573**


(*Please turn to page* 635)

# Outstanding Personalities of the Wire Industry

### Dr. H. R. Copson Awarded Charles B. Dudley Medal

THE nineteenth award of the Charles B. Dudley Medal of the American Society for Testing Materials was presented in June to **Dr. Harry R. Copson**, research chemist with the Bayonne Research Laboratory of **The International Nickel Company, Inc.**, during the annual meeting of the Society held at the Hotel Statler in Buffalo. The award is given for the outstanding paper of the year involving original research and was in recognition of Dr. Copson's paper on "A Theory of the Mechanism of Rusting of Low Alloy Steels in the Atmosphere."

* * *

### MacWhyte Observes Golden Jubilee

**THE MACWHYTE COMPANY** Kenosha, Wisconsin, recently celebrated their 50th anniversary that was linked with the tenth annual company's employee dinner.

THE program included a review of the company's progress together with reports for the last year and a statement on the future outlook. Jessel S. Whyte, president, presided. All employees who had completed twenty-five years service with the company received gold watches.

* * *

IT was recalled that the company was launched February 10, 1896, when George S. Whyte, F. T. Macomber and H. J. Sampson made application for the incorporation of Leschen, Macomber, Whyte company with an original capital stock of 2,500. The present capital stock of the company is $2,096,680, consisting of 300,000 shares at $10 each with some held in reserve.

* * *

THE offices were located for several years in Chicago with the name of the corporation changed to the Macomber & Whyte Rope Company in 1900. The first plant of the company was located in Coal City, Illinois, but in 1912 the factory was moved to Kenosha, where it has since been located and grown steadily.

* * *

IN May, 1920, the names of the corporation was changed to MacWhyte company.

* * *

MAY we take this occasion to extend our own felicitations to the MacWhyte Company on behalf of ourselves and the members of the Association and to wish them a continuation of their much-merited success.

* * *

### Leonard S. Webb

**LEONARD S. WEBB** died recently at the age of sixty-nine. He was vice president and treasurer of the Webb Wire Works, Inc., New Brunswick, N. J., manufacturers of music and other specialty wires.


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Equipped with a temperature indicating annealing and tempering device, voltage regulator and meter to compensate for voltage fluctuation, wire cutters, extra large 5" diameter magnifying glass, fluorescent light and extension cord. Welder can be supplied for bench mounting, or mounted on 4-wheel truck.

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CHICAGO 6, ILL.
Telephone: State 7468

## Eaton Group Forms New Steel Company

**CYRUS S. EATON**, Cleveland industrialist and one of the nation's leading bankers, announced that he and a group of associates, including **William R. Daley**, president of Otis & Company, have organized a new steel company known as the **Portsmouth Steel Corporation** to acquire the Portsmouth works of the **Wheeling Steel Corporation** at Portsmouth, Ohio.

* * *

IN a registration statement filed with the Securities and Exchange Commission today, it was revealed that the Portsmouth Steel Corporation, which was incorporated on May 23, would issue 1,025,000 shares of common stock to the public at $10 per share.

* * *

THE registration statement also revealed that the purchase price of the properties that Mr. Eaton and his associates are acquiring from Wheeling Steel would be $12,000,000. For this amount Portsmouth Steel will acquire Wheeling's present Portsmouth works, the Emperor Coal Company of Kentucky, the Portsmouth inventories and work in process, and working capital.

* * *

THE Portsmouth Steel Corporation will have a capacity of approximately 50,000 tons of steel ingots per month, and will engage in the manufacture of a variety of steel products including ingots, slabs, sheet bars, tie plates and wire products.

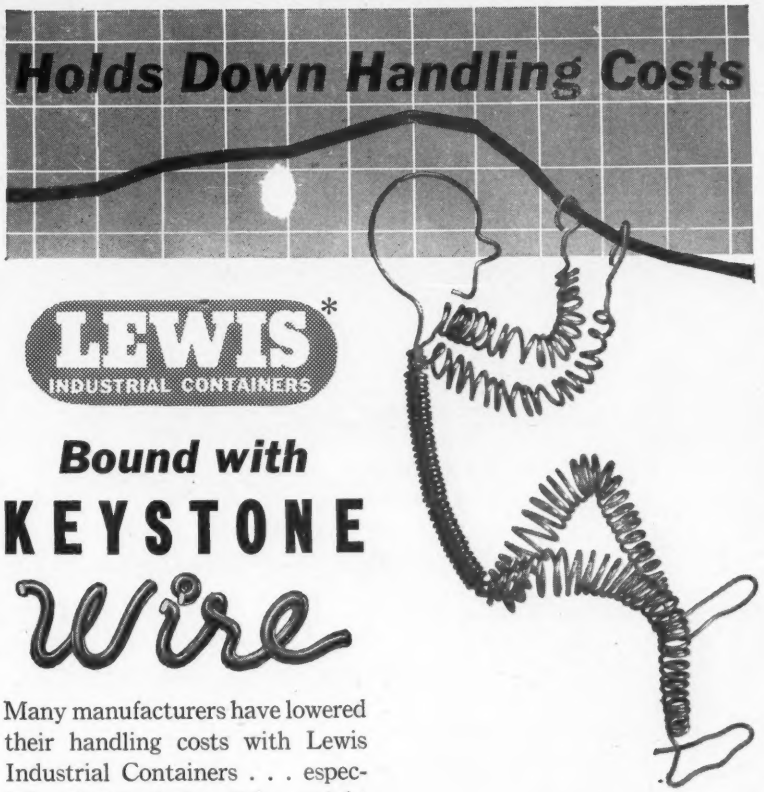
* * *

## Leahey to Manage Battle Creek Wire Mill for Nichols

**F. P. LEAHEY** has been made Manager of **Nichols Wire & Steel Co.**, Wire Mill at Battle Creek, Michigan.

* * *

MR. Leahey, prior to coming with this Company worked for the Spencer Wire Company at West Brookfield, Massachusetts, and came to them from the American Steel & Wire Company with which concern he had years of operating experience, both at Worcester and in the Cleveland district.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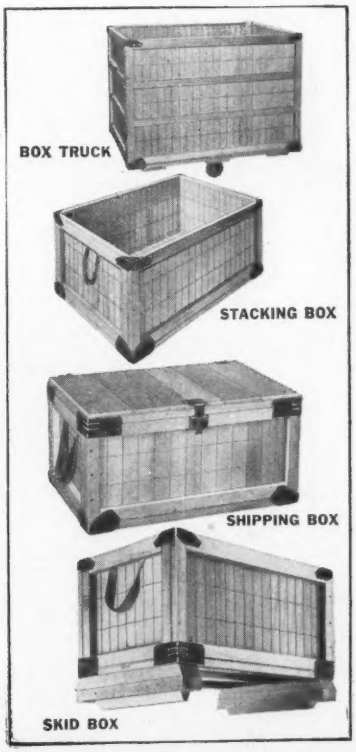
*Watertown, Wisconsin*

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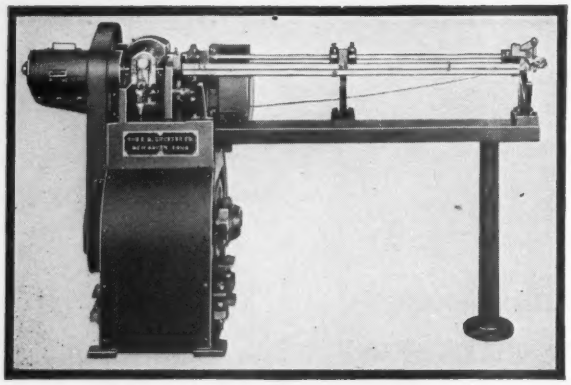
REG. U.S. PAT. OFF.
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Coppered, Tinned, Annealed, Galvanized



SHUSTER WIRE STRAIGHTENER TYPE A
Wire Capacity 1/32" - 1/16" Diameter

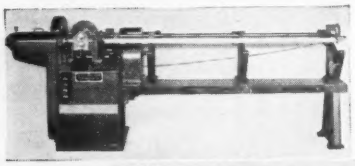
# Faster Cutting Speeds
## GREATER PRODUCTION!

★

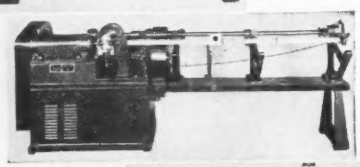
**Outstanding Features —**

Almost continuous wire travel
Lightning cut-off assures square-cut ends
High speed, direct driven 5-die straightening flier
Quiet, highly efficient V-belt motor drive
Ball and roller bearings throughout
Extremely rigid construction
Fully guaranteed as to material and workmanship

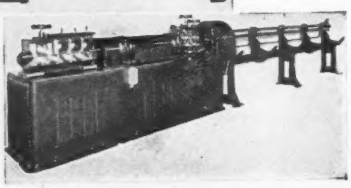
**Descriptive folder on request**



Type 1A
1/16" - 3/16"
Dia.



Type 2A
1/8" - 1/4"
Dia.



Type 3A
3/16" - 3/8" Dia.

Type 4A (not shown)
3/8" - 5/8" Dia.

THE F. B. SHUSTER MFG. CO., INC., NEW HAVEN, CONN.

SHUSTER SINCE 1866

Automatic WIRE STRAIGHTENING AND CUTTING MACHINES


## A. S. & W. Appoints Fenner as Superintendent at Waukegan

J. **M. FENNER** has been appointed division superintendent, stainless steel, at the Waukegan, Ill., Works of the **American Steel & Wire Co.**, United States Steel subsidiary. **Ronald E. Griffiths** will succeed him as supervisor of the research laboratory in Cleveland, Ohio.

★ ★ ★

MR. Fenner is a native of Cleveland, having attended the Case School of Applied Science from which he graduated with a B.S. degree in engineering. Mr. Fenner has worked for the American Steel & Wire Co. since August 1933, when he started as a laboratory assistant at Newburgh Works. He has held his present position since March, 1940.

★ ★ ★

## Sutch Appointed General Superintendent Clinton Plant, Wickwire Spencer Steel

R. **T. DUNLAP**, Vice President in Charge of Operations, **Wickwire Spencer Steel,** has announced the appointment of **D. A. Sutch** as General Superintendent of the Clinton plant.

★ ★ ★

MR. Sutch, who has been Works Manager of the Wickwire Spencer Aviation Corporation, Newark, New Jersey, subsidiary of The Colorado Fuel and Iron Corporation, succeeds G. G. Lloyd, who was recently transferred to the Buffalo plant as General Superintendent.

★ ★ ★

AT the Clinton plant Wickwire Spencer manufactures poultry netting, industrial wire cloth, perforated metal, metal conveyor belts and other steel specialties.

★ ★ ★

## Buffalo Bolt Forms Export Subsidiary

**BUFFALO BOLT COMPANY** has formed a new subsidiary company to handle the export business of the parent company and its two manufacturing subsidiaries. The subsidiary is the Buffalo International Corporation, with **Joseph C. Walker** as president. Vice president is **Colman Curtis, Jr.**, and **S. C. Wead**, secretary-treasurer.

## Stone to Manage Coshocton General Electric Plant

APPOINTMENT of **Guy M. Stone** as manager of the Coshocton, O. plant of the **General Electric Plastics Divisions** has been announced by **William H. Milton, Jr.**, manager. The Coshocton factory, to be used for the manufacture of laminated plastics, is now under construction.

* * *

MR. Stone is now serving as manager of the Lynn Works of the G-E plastics divisions from where the laminating manufacturing operations are soon to be transferred. He has held this position since 1939.

* * *

MR. Stone has been associated with General Electric for 30 years in Schenectady, Baltimore, Philadelphia, Meriden and Pittsfield.

* * *

## Nichols Appoints Sales Manager

C. J. **GASPAR** has been appointed to the position of Sales Manager, Manufacturers Wire, for the **Nichols Wire & Steel Co.**, Davenport, Iowa.

* * *

MR. Gaspar was employed by the Company in December, 1945, after his release as a Lieutenant Commander from the Navy, for which Branch of the Service he served for approximately two and one-half years.

* * *

PRIOR to entering the Service, he had been Assistant Sales Manager of the Stainless Steel Department of Pittsburgh Steel Company, and had worked for Pittsburgh Steel for approximately five years.

* * *

MR. Gaspar's many friends in the Industry will be pleased to learn of his new connection.

* * *

## Sedam to Handle Production for Alloy Rods Company

M. G. **SEDAM** was recently appointed vice president in charge of research and production, **Alloy Rods Co.**, York, Pa. Mr. Sedam has been associated with the company since 1943 as director of research.

## *An Explanation and an Apology!*

*The August issue of "WIRE AND WIRE PRODUCTS" reaches its readers several days later than usual, due to failure of the paper supplier to meet his delivery date. We apologize to our readers and advertisers for this delay even though it is beyond the control of the printer and the publisher.*

*THE EDITOR*


THE WIRE ASSOCIATION

**1946 CONVENTION**

*Will Be Held at*

**HOTEL STATLER, BUFFALO, N. Y.**

**October 21 — 24, inclusive, 1946**

* * *

Detailed program will be published in the September issue of WIRE & WIRE PRODUCTS.

Technical papers will be preprinted in the October issue of WIRE & WIRE PRODUCTS.

For information and hotel reservations write

RICHARD E. BROWN, Executive Secretary

**THE WIRE ASSOCIATION**

**300 MAIN STREET** **STAMFORD, CONN.**

## Continental Wire Corporation Organized

ANNOUNCEMENT was made today of the formation of the **Continental Wire Corporation,** which will occupy the building at 501 Prospect Street, York, Pa. The officers of the company, all previously connected with the York Wire and Cable Division of the **General Electric Company** are: **C. C. Christiansen,** President; **Edgar Q. Harrigan,** Vice president; **J. C. Shafer**, Secretary; and **Harold Olden,** Treasurer.

* * *

MR. Harrigan, in charge of sales, stated that at present the company will manufacture electrical wire and cable of the heat and flame resistant types, for use in lighting fixtures and appliances. The company will gradually expand into other types of insulation, such as glass and synthetic, and will eventually be in a position to offer a wide variety of wire insulations for use in the electrical industry. Plans are under way to produce all those products for both foreign and domestic markets.

* * *

## Lehmann Becomes Assistant Manager of General Electric Plastics Divisions

APPOINTMENT of **George P. Lehmann** to the newly created post of assistant manager of the **General Electric Plastics Divisions** has been announced by **William H. Milton, Jr.,** Manager of all G-E plastics operations.

* * *

A former colonel in the 12th Air Force Service Command, Mr. Lehmann has been staff assistant to the manager of the Plastics Divisions since his return from service last fall. He was previously assistant to the chief engineer of the Plastics Divisions and also served as plant engineer at the G-E Meriden, Conn. plant. Mr Lehmann joined the General Electric Company in 1935.

* * *

## Walter F. Schneid Made Vice President of Eastern Stainless Steel Corp

T. F. **McLAUGHLIN,** president of **Eastern Stainless Steel Corporation,** announces that **Walter F. Schneid** has joined the Company in the capacity of vice president in charge of operations.

* * *

MR. Schneid has been connected, as superintendent, with Crucible Steel Company of America, in Syracuse, New York, and prior to that with Rustless Iron and Steel Corporation, in Baltimore.

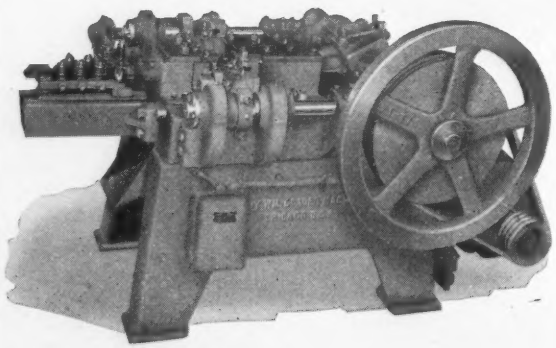
* * *

## National Standard Makes Changes

KIMBALL D. SMITH, general manager Worcester Wire Works Division of **National Standard Co.,** has been transferred to the Akron, Ohio, plant. **M. E. Murphy,** formerly of the Standard's Clifton, N. J. plant, succeeds Mr. Smith at Worcester.

* * *


# GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

**WM. GLADER MACHINE WORKS**

**210 No. Racine Ave.**
**Chicago 7, Illinois**

# GOVERNMENT WIRE PRODUCTION INFORMATION

## Report Describes German Steel Process that Saved Alloying Metals

DEVELOPMENT of processes for production of steel with low sulphur and phosphorus content during the war enabled the Germans to save alloying metals and maintain mechanical specifications, according to a report now on sale by the Office of the Publication Board, Department of Commerce.

* * *

THE 146-page report, by Dr. T. P. Colclough of the British Ministry of Supply, covers developments in the German iron and steel industry in the Ruhr and Salzgitter areas. It was prepared for the Combined Intelligence Objectives Sub-Committee in June, 1945.

* * *

AMONG the many unusual features of German steelmaking practice described in the report are:

**1) Rigid exclusion of phosphoric iron from open hearth furnaces and its reservation for use in the Thomas converter.**
**2) Production of low-nitrogen, low-phosphorus, non-strain-aging steels in the Thomas converter.**
**3) Further development of the radial rolling mill system for rolling boiler drums and pressure vessels.**
**4) Development of centrifugally cast or spun steel.**
**5) New methods for large-scale manufacture of iron powder of moderate purity and fineness.**
**(6) Improved high-pressure sintering methods for tungsten carbides.**

* * *

PRODUCTION of bulk steels from highly phosphoric irons was carried out almost entirely in the Thomas converter. The heavy metallurgical load was harnessed as fuel, and a very high rate of production was achieved. The process was used to make structural, rail, and similar steels.

* * *

LOW-NITROGEN, low-phosphorus steel made in the Thomas converter was used for such products as welding rod and non-aging sheets. The steel was produced by half-blowing a normal charge and adding sufficient ore to promote a vigorous boil. In most cases, blowing was then resumed to the end point, which was usually one and one-half minutes short of normal. Steel containing less than 0.010 per cent nitrogen was readily obtained by this process.

* * *

A NEW radial rolling mill, capable of taking trepanned ingots up to 120 tons in weight, was installed by the August Thyssen works at Muelheim in 1937. The ignots were centrifugally spun on a vertical axis. The rolling mill turned out tubing up to 18 meters long and 1.8 meters in diameter, with a wall thickness up to 180 millimeters and a maximum weight of 100 tons.

* * *

AN ingenious method of making iron powder for soft iron driving bands for shells was developed


EXTRUDER TAKE-UP . . . . .

We have developed a new type of electrical driven take-up for use in connection with the insulation of small wires.

The speed of the take-up and the tension of the wire is controlled by the wire itself. We have several of these machines in continuous operation for over six months and they are working satisfactorily.

We can vary the speed from 75 to 1000 feet per minute and vary the tension so that we can run wires as small as 7-#35 strand with 10 mill wall. We can run reels as large as 30" diameter with a 14" traverse.

The unit consists of a motor, variable speed drive, outboard main shaft mounted on ball bearing pillow blocks, and an adjustable electrically operated traverse with necessary contactors to operate the motor and motor controls to vary the torque of the motor and the tension of the wire.

This unit is inexpensive in cost and we can make prompt delivery.

*For further information write the*

R. L. DAVIS ELECTRIC COMPANY

WALLINGFORD, CONNECTICUT

by Krupp's Widia Works, at Essen, to save copper. It consisted of pouring molten iron of reasonable basic purity either into a water jet impinging on rotating blades, or into a high-pressure jet of mixed steam and air. After drying, the product was charged into heat-resisting steel boxes and heated in a gas-fired furnace. The resulting cakes of nearly pure iron were knocked, crumbled, or milled and then sieved.

* * *

KRUPP also used an improved high-pressure sintering process, involving use of electrical resistance-heated precision graphite moulds. The company had succeeded in producing rings for deep drawing steel cartridge cases up to 220 millimeters, outside diameter, and 150 millimeters, inside diameter. The rings were pure tungsten carbide with 15 percent cobalt binder.

* * *

THE report includes numerous tables and diagramatic sketches

* * *

ORDERS for the report (PB-16720; photostat, $10; microfilm, $1.50) should be addressed to the Office of the Publication Board, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

* * *

## U. S. Steel Purchase of Geneva Steel Plant Approved

THE War Assets Administration, upon the advice recently received from the Attorney General that disposal of the Geneva Steel Plant to U. S. Steel Corporation was not a violation of the anti-trust laws, entered into an agreement with U. S. Steel Corporation under which a cut-off date of midnight June 18. 1946, was established in order that the plant be placed in operation as soon as possible.

* * *

UNDER this agreement, consent is given to the Geneva Steel Company, a subsidiary of U. S. Steel Corporation, to enter upon and use the premises and facilities as of June 19, 1946, for its own account.

* * *

## Post War Electric Blanket Approved by Underwriters

A POST-WAR automatic electric blanket incorporating some of the basic principles which were employed in electrically heated flying equipment for the Army Air Forces, and which uses a war-developed heating wire, has passed all tests of the Underwriters' Laboratories, Inc., the automatic blanket division of the General Electric Company announced. The automatic electric blanket was immersed for one hour in salt water without current leakage or voltage breakdown and passed a variety of overheating and wear tests. In addition, its heating wire has flexed more than 100,000 times without breaking. This product, the company pointed out, is now being placed in quantity production at its Bridgeport, Connecticut factory.

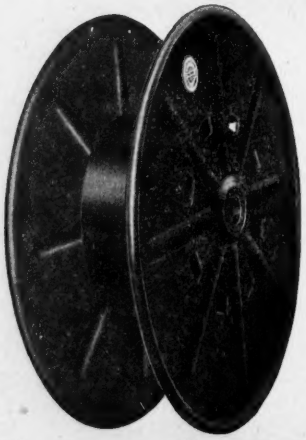

**MOSSBERG PRESSED STEEL CORP.**

Greater service from a new All Welded Steel Take Off Reel designed to meet present day requirements.

Usual maintenance expense eliminated by adoption of this new design wherein all parts are welded into one homogeneous unit.

Reel sides are embossed with radial reinforcing ribs for increased rigidity with rolled edges for additional strength and to facilitate handling.

Complete line of spools and reels for both processing and shipping all kinds of bare and insulated wires and cables. (Send for Catalogue W-104)



All Welded Steel Take Off Reel

**MOSSBERG**
**Pressed Steel Corp.**
18 WEST STREET
ATTLEBORO, MASSACHUSETTS, U. S. A.

James Day (Machinery), Ltd., "Ford House," 88 Regent Street, London, W. I., England.

# A Review of Recent Wire Patents

No. 2,401,319, MANUFACTURE OF WIRE MESH FABRIC, patented June 4, 1946 by George R. Roemer, Mount Lebanon, Pa.

This is a continuous method in which parallel, spaced-apart line wires are moved longitudinally, and stay wires are formed, with partial loops spaced apart at intervals equal to the spacing of the line wires and disposed about the latter, whereupon the loops are closed simultaneously around and under all of the line wires.

* * *

No. 2,401,329, WIRE HEADING APPARATUS, patented June 4, 1946 by Charles O. Blaisdell, Oak Park, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

In addition to a reciprocating punch and cooperating die member, through which the wire is threaded, there is a perforated tape provided movable with its aperture in alignment with the punch, which latter is actuated to shear off a perforated pellet therefrom and the pellet is then carried to a tapered recess in the die member where it is compressed around the wire to form a head.

* * *

No. 2,401,398, METHOD OF TESTING INSULATED CONDUCTORS, patented June 4, 1946 by Robert L. Wright, II, Dundalk, Md., asignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

**Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.**

A method is disclosed for locating faults in these conductors as they are advanced from the supply.

* * *

No. 2,401,518, POWER-DRIVEN WIRE REEL MECHANISM, patented June 4, 1946 by Temple C. Smith and Howard D. Brown, Westfield, N. J., assignors to American Telephone and Telegraph Company, a corporation of New York.

One or more reels are mounted on a framework and operated by a power supply, each being separately controlled by clutches and brakes also mounted upon the framework.

* * *

No. 2,401,676, MACHINE FOR WINDING COILS, patented June 4, 1946 by Karl H. Weber, Toledo, Ohio.

There are 15 claims in this patent for a machine to wind coils, such as are employed in electric regulators. This is related to the method disclosed in U. S. Patent 2,362,179.

* * *

No. 2,401,954, TESTING APPARATUS, patented June 11, 1946 by William Newton, Notre Dame de Grace, Quebec, Canada, assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

The testing apparatus comprises a search coil mounted on the wire distributor in such position that its effective inductance will be varied by the presence of a short circuit in a coil being wound.

* * *

No. 2,402,342, SCREW, patented June 16, 1946 by Henry F. Phillips, Portland, Oreg., assignor to Phillips Screw Company, Portland, Oreg.

A screw is provided having a tool receiving recess formed in its head, said recess being defined by alternate flutes and ribs, the bottom walls of these flutes lying in a frusto-conical surface, the ribs being convexly curved and joining the bottom walls at right angles, each of these ribs having its axis of curvature extending wholly in the frusto-conical surface.

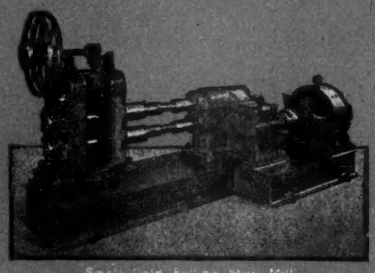
* * *

No. 2,402,551, METAL PROTECTIVE COATINGS, patented June 25, 1946 by Harold S. Holt, Wilmington, Del., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware.

These coatings comprise lanolin, a volatile organic solvent, and ethyl cel-

(*Please turn to page* 634)


WEAN-BRODEN



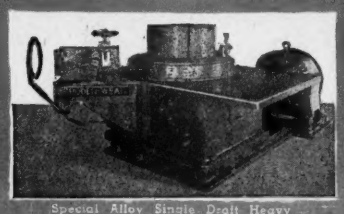
Small Cold Rolling Strip Mill

THE Wean Engineering Company, Inc., have long been recognized as specialists in sheet, strip and tin mill equipment . . . The Broden Construction Company specializes in the manufacture of narrow strip and wire mill equipment.

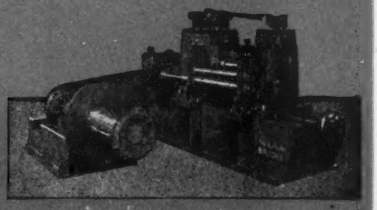
With the extended facilities of The Broden Construction Company as a subsidiary of The Wean Engineering Company, Inc., it is now possible to serve the steel industry more effectively.

COLD ROLLING MACHINERY
For 36" Wide Material and Narrower
Mills • Reels • Slitters • Levelers • Coilers
Edgers • Scale Breakers • Shears
Scrap Ballers • Continuous Pickling

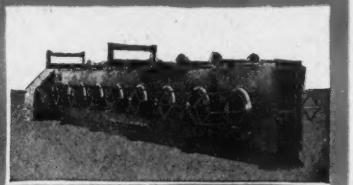
WIRE MILL EQUIPMENT
Wire Drawing Machines • Patenting
Galvanizing and Tinning Take-Up Frames
Wire Flattening • Spoolers • Nail
Galvanizing and Blueing



Special Alloy Single Draft Heavy Duty Vertical Wire Drawing Block for ⅝" Round Wire



HOLMQUIST BARBED WIRE and WIRE FENCE MACHINERY



The BRODEN CONSTRUCTION Co., Inc., Cleveland, O.
A SUBSIDIARY COMPANY OF
The WEAN ENGINEERING Co., Inc., Warren, O.

## Carbide Forming Tools Save Staple Manufacturer $2000 per Year on Tools

AN estimated saving of at least $2000 per year on staple-forming tools alone and a four-hundredfold increase in service life of the tools between grinds after tipping the tools with Carboloy cemented carbide has been reported by Western Wire Products Co. of Los Angeles, California, manufacturers of wire staples. Continuity of production was also materially improved due to the elimination of down time for removing and grinding the forming tools.

* * *

THE purpose for which the tools are being used at Western Wire include the making of staples for upholtery and for electrical installations. The former are made from low carbon steel stock, .050" x .026" in size. Staples for electrical installation work are produced from high carbon steel stock 0.60" x .055" in size. The work is performed on Nilson staple making machines which have speeds up to 48,000 staples per hour.

* * *

WHEN using conventional high speeds steel forming tools, Western Wire re-ground the tools after each lot of 375,000 staples. In an effort to increase the tool life between grinds, the cutter and former bar, former bar, anvil, and the cutter quill were tipped. with Carboloy Grade 44A carbide, which combines excellent toughness with a high degree of wear resistance. These produced 150,000,000 upholstery staples without having to be removed from the machine. This performance indicates a service life between grinds of at least 400 times that of the steel tools.

* * *

A similar experience was encountered in the production of staples for electrical installation work. On this operation Western Wire high speed steel tools were reground after producing approximately 300,000 units. With the Carboloy tools some 7,000,000 staples were produced without requiring regrinding, the carbides still being in condition for further use.

* * *

INCIDENTALLY, equally good performance was reported at all speeds of the Nilson machine. Western Wire Company estimates that the use of carbide tools on this one operation alone is currently saving them at least $2,000 in tools. In addition, of course, the use of Carboloy metal has eliminated the frequent machine shutdowns for removing tools and regrinding them.

* * *

## Observer at Bikini

ROBERT M. AKIN, Jr., Sleepy Hollow Manor, director of research at the **Hudson Wire Company**, Ossining, which supplied items for the atomic bombs, has accepted the invitation of Vice Admiral W. H. P. Blandy, USN, commander of Joint Task Force One, to witness as the Navy's guest, "Operation Crossroads" at Bikini Island in July.


# "STEELSKIN PRODUCTS"

AS A RESULT OF INTENSIVE RESEARCH AND DEVELOPMENT, HAVE LED TO MANY PRACTICAL APPLICATIONS SUCH AS—

1. The elimination of trouble on the more difficult drawing work and at the same time allowing high speeds and increased die life.
2. The elimination of acid and annealing smut by use of a special compound in the cleaning house.
3. The elimination of lime for most types of wire drawing by the use of special coatings and lubricants to fit these coatings.
4. The drawing of bright wire, such as for coat hanger stock, on continuous machines finishing at high speeds.

IF YOU HAVE ANY PROBLEMS SIMILAR TO THOSE ABOVE OUR ENGINEERS WILL BE GLAD TO CO-OPERATE

"STEELSKIN PRODUCTS" are manufactured by

**R. H. MILLER COMPANY., Inc.**

HOMER, NEW YORK

Established 1909

## Salt Baths in the Wire Industry

(*Continued from page* 596)

was quenched in water from 1600° F-1625° F reached its highest hardness in five seconds, There was no increase with further austenitizing time.

* * *

SOME experiments were run with spring wire of .60 carbon, .80 manganese and .15 silicon which had been drawn to .105 gauge from number 5 air patented rods. The wires were all transformed in a bath maintained at 950° F. for 30 seconds, and quenched in water after they had been subjected to the austenitizing treatments as shown in Table "A".

* * *

With violent agitation of the transformation bath, wire austenitized at 1625° F. for 15 seconds produced a tensile of 169,800 lbs. per square inch. There is some advantage in properly agitating the transformation bath. The following table gives some suggested speeds and rates for a furnace designed to give fairly low electric costs. See Table "B"

**TABLE "A"**

| Austenitizing temp. | Time in seconds | Break. Wt. in pounds | Tensile lbs. per square inch |
|---|---|---|---|
| 1600°F — 1625°F | 8 | 1410 | 164,000 |
| " | 15 | 1400 | 162,800 |
| " | 30 | 1410 | 164,000 |
| " | 60 | 1410 | 164,000 |

**TABLE "B"**

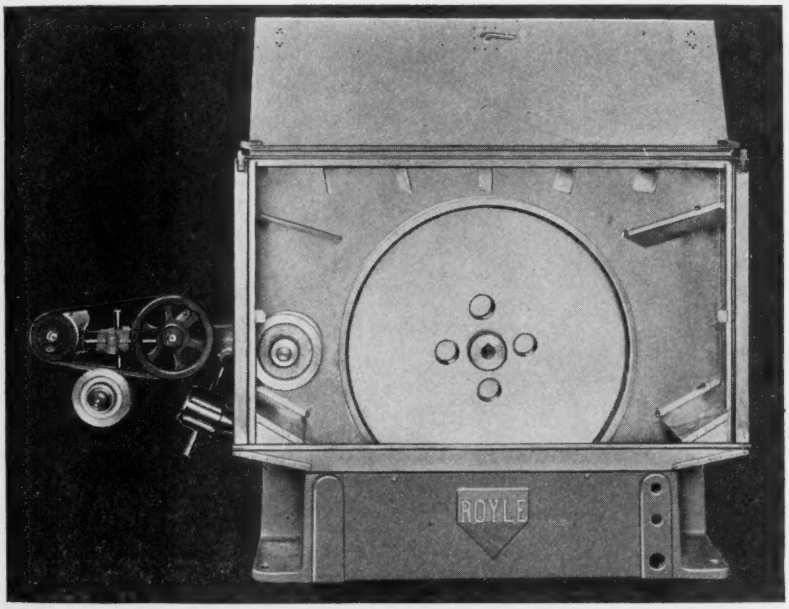
| Wire gauge | Lbs. per foot | Speed feet per minute | Lbs. wire per strand per hour | Number of strands | Total Production per hour |
|---|---|---|---|---|---|
| .150 | .0598 | 32 | 115 | 18 | 2,000 |
| .125 | .0142 | 40 | 100 | 20 | 2,000 |
| .082 | .0179 | 55 | 59 | 34 | 2,000 |
| .060 | .0096 | 100 | 58 | 34 | 2,000 |
| .023 | .0014 | 150 | 12.6 | 40 | 504 |

The most important advantages of double salt patented spring wire are recapitulated and stated below.

1. **Lower overall cost.**
2. **Most uniform physicals.**
3. **Highest quality.**
4. **Less floor space required.**
5. **Elimination of use of acid.**
6. **No baking required.**
7. **Less material tied up in mill.**
8. **Less material handling.**

## Spring Rod Patenting and Descaling

RODS may be patented in the same manner, with the additional advantage of descaling during the process. The furnace design might be advantageously altered, lengthening the high temperature pot to give a longer soak, and making it narrow as possible to cut down ra-


**The Royle 36" High Speed Capstan for Resin Insulated Wire**

- Stainless steel watertight enclosure
- Total enclosure permits higher wire speeds
- More efficient wire puller stabilizes wire speed
- Secondary idler pulleys guide wire across capstan preventing rubbing and permitting larger quantities to be cooled simultaneously
- All bearing located outside of enclosure to prevent contact with water
- Quiet running
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diation losses. A mechanical scale breaker before the rods enter the high temperature bath cuts down on the amount of sludge and aids in the descaling.

* * *

THE baths used in this process are only mildly descaling and acid may be omitted entirely only when the rods have been rolled in a mill which minimize the scale by controlling the rolling temperatures and using descalers.

* * *

A recommended setup for patenting and descaling spring rods would be as follows: the rods pass continuously in single strand through the high and low temperature salt baths. The rods then pass through a salt recovery unit into a cold water wash, a short acid dip, a cold water wash, lubricant, dryers, and take up reels. The normal salt consumption for number 5 rods would be about 30 lbs. per ton without a salt recovery process. This is considerably less than the 75 lbs. per ton quoted for the .082 wire on account of the slower speed and lower ratio of surface area to weight. Using a salt recovery plan the total salt consumption should not be over 20 lbs. per ton.

* * *


MAINTENANCE DATA SHEET NO. 4

**CLAMPS FOR SCOTT TESTERS**

If discrepancies still remain after correcting the Tester head, the difficulty may lie in the clamps.

On flat grip clamps for testing fabric, sheet metal or similar material, the gripping surfaces MUST be absolutely flat and parallel. Place a sheet of white paper and of very soft pencil carbon paper between the clamps, and close them tightly. If carbon is not deposited uniformly over the white paper it will indicate that the surfaces have become worn by testing hard material, or distorted by excessive pressure on the closing screw. Such clamps should be returned to the factory for resurfacing and realignment.

To determine parallelism of the long edge of the gripping surface: move the lower clamp down about 1"; measure the distance between the edges of the gripping surface at both ends. If not parallel, adjust the clamp which is out of line, by straightening the connection joining this clamp to the testing machine.

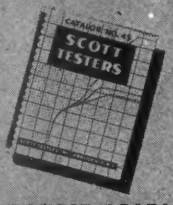
Cord, twine, wire or similar materials require drum-type clamps, of which the drum surface must be absolutely smooth, while the gripping surface of the clamps must apply uniform pressure throughout.

On wedge-type wire clamps, after considerable service the gripping surfaces become worn. Replacement inserts can be ordered, which are easily installed.

On drum-type wire clamps, (as the Jute Association wire clamp) the drum, eccentric roll and anvil should be replaced as soon as any amount of wear shows.

On all clamps, any surface subject to friction should be lubricated periodically, especially the hinge, screw thread and contact between screw and clamp body of fabric clamps, and the sliding wedge of wedge-type wire clamps.

A Complete Set of these Data Sheets will give your Maintenance Man Valuable hints. Previous Sheets will be sent upon request.

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**SCOTT TESTERS, INC.**

55 BLACKSTONE STREET, PROVIDENCE, RHODE ISLAND


A comparison of this process with conventional methods is as follows:

**Double Salt Operation**

1. Transport rods to furnaces.
2. Patent, descale, lime & dry.
3. .....
4. .....
5. .....
6. .....
7. Transport to wire mill.

**Air Patenting or Lead**

1. Transport rods to furnaces.
2. Patent.
3. Transport rods to pickle dept.
4. Pickle.
5. Hose, and lime cost.
6. Bake.
7. Transport to wire bill.

Operations 3 and 4 are omitted in the salt treatment, while 5 and 6 are done in the continuous treatment.

* * *

## Subcritical Annealing and Descaling

SOME wire mill applications involve slack or subcritical annealing. Very often this process is used to restore hard drawn low carbon wire to a soft, stress free condition for further drawing or to meet physical property specifications, requiring an annealed structure.

* * *

IN this type of heat-treatment it is usually only necessary for the wire to reach the annealing temperature and no soak or holding time at temperature is required. Cold drawn low carbon structures respond very rapidly. The temperature range usually employed varies between 1200° F. and 1350° F. depending on the type of steel. The temperature control is not nearly so critical as in some other processes. One could use a gas or oil fired installation which would mean a very low capital investment. Due to the rapid heating in salt baths and the metallurgical considerations discussed above, a small salt bath installation would do the work of a bell type unit costing at least several times as much.

* * *

A practice may be devised so that the surface will be scale free and there will be no need for pickling. This would probably require two baths, or at least quenching

from the annealing bath. There would undoubtedly be some increase in hardness with low carbon analyses due to the phenomenon of quench aging.

* * *

THE cost of annealing is considerably enhanced for several reasons when provisions for bright annealing are made. One, the constituents of baths designed for bright finishes are usually much more expensive than the ordinary baths and therefore, retail for considerably more. There can be no time for allowing the salt to drain off and naturally when coils are quickly quenched the salt adhering to the surface and trapped in between the coils is lost in the quenching medium.

* * *

ONE may simultaneously descale and anneal hot rolled rods of straight carbon steels. The cyanide containing bath mentioned elsewhere will completely descale a bundle of number 5 rods in a few minutes at 1200 °F. This bath should not be operated in excess of this temperature due to the fumes and bath breakdown. The cyanide breaks down to cyanate and then to carbonate.

* * *

A desirable job of descaling number 5 spring rods was done by austenitizing at 1600° F. for five minutes in a neutral bath and immersing the bundle in the cyanide bath for ten minutes at 1050° F. The bundle was then quenched in cold water. The resulting surface was entirely free of scale and had a nice, pleasing bright finish. Since sodium cyanide is an expensive compound it is questionable whether such practices will be very desirable from the cost standpoint.

* * *

### Annealing Stainless Steels and Non-Ferrous Alloys

SALTS are in use which protect the surface of stainless steel so that this alloy may be annealed with a bright, scale free finish. Austenitic stainless and heat-resisting non-ferrous alloys are quenched directly from the annealing bath. The resulting finish is a function of the mass of material being quenched, the temperature from which it is quenched, the time consumed in getting into the quench tank, and the composition of the quench.

* * *

AS an example, sections such as fine wire result in a bright scale free finish when quenched in water, slightly larger sections being somewhat discolored, presumably by the steam formed when the material enters the water. Violent agitation no doubt would alleviate some of this. A desirable finish is obtained in slightly larger sections by adding some sodium chloride or preferably zinc chloride to the quench bath. There is discoloration even in this procedure when the section being annealed reaches a certain mass. In this case, it is sometimes helpful to quench in oil.

* * *

THEORETICALLY, one should be able to bright anneal fine stainless wire in coil form. In actual practice the difficulties and objections seem unsurmountable and the process is not desirable.


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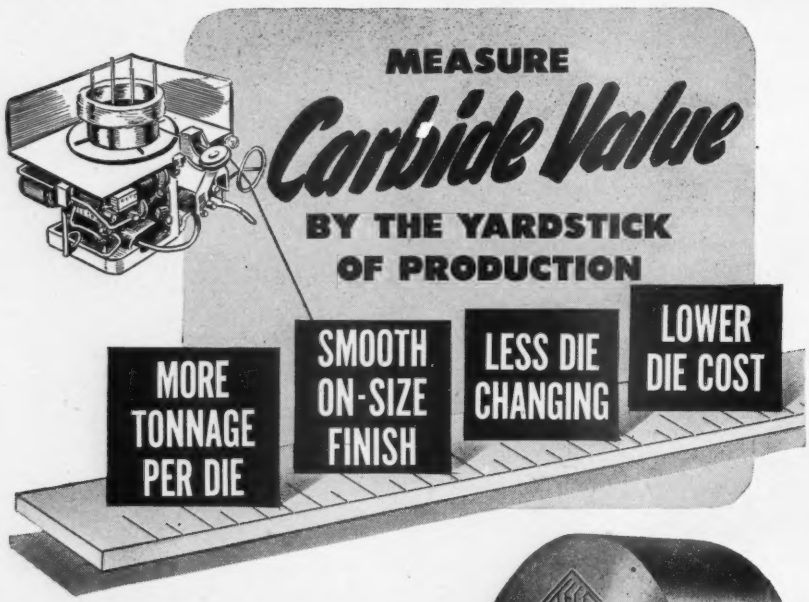
THE salt seems to drain off the outside strands so rapidly that they oxidize slightly unless the coil is immersed within a very few secons. Then the mass of material is great enough so that enough steam is formed to greatly discolor most of the outside strands. Salt is trapped in the inside of the coils and it is practically impossible to remove it. Keeping the proper shape of the coil is also difficult. The inside strands cool so slowly it is doubtful if it can be said they are properly annealed. Even if these coils are opened up, salt collects where a few strands touch and make things difficult. In coarse sizes a procedure may be worked out successfully. In any case, the salt drag-out would be a serious problem. Alkaline earth chlorides must be used for the high temperatures but they have a very high specific gravity and consequently high salt drag-out. The radiation losses also increase very rapidly as the temperatures are increased so that the electric cost becomes quite large.

* * *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THE most desirable method of salt annealing stainless fine wire is continuously in multiple single strands. This insures a good clean, bright surface and a high quality anneal.

* * *

STAINLESS steel process wire may be bright anealed continuously in salt. The rapid heating in a molten salt bath would permit a comparatively fast travel through the bath so that the fuel and labor cost would be minimized. While the salt consumption would be high on account of the speed and wire size, the cost should be more than offset by the elimination of the use of hydrogen.

* * *

THE cost of annealing 1000 pounds per hour at 2000° F. can be estimated within reasonable limits. The KW requirements would be about 502 per hour with an uncovered bath. With a proper cover to cut down radiation losses the KW might be dropped to 402 per hour. The salt consumption should not run over 45 pounds per hour at 5 cents per pound. For electric cost of 6 mills the combined electric and salt cost would be in the order of 9.30 dollars. This, one must add to labor, electrode replacement and ceramic pot maintenance. On a five day schedule the pot would be idled at about 1450° F. for 48 hours. During this idling period the electric consumption would be about 140 K.... per hour, or 8 cents per hour at 6 mills per KW. The total cost would run between 12 and 15 dollars a ton. These costs very likely could be substantially lowered if quality requirements can be met at a lower temperature of operation, and also by increasing the speed of the wire through the bath, or modifying the furnace design.

* * *

A recent interesting develoipment in salt bath heat-treatment is a bath which relatively quickly and completely descales all varieties of stainless steels and non-ferrous chrome nickel alloys. The bath is essentially made up of alkaline earth chlorides with descaling chemicals added. The bath gradually grows weaker as more and more material is descaled. Special rectifiers are added to rejuvenate the bath. While

some low alloy and straight carbon rods may be descaled as low as 1650° F., the bath is more effective at the higher temperatures. Probably 1750° F. is as low as one should go with the austenitic grades, and 1850°F-1900° F. produces a very active and efficient descaling medium.

* * *

IN the laboratory with sample pieces, austenitic stainless rods have been descaled in as little time as three minutes, while 80% chromium and 20% nickel required about eight minutes. The action is entirely chemical and requires no electric current. Since steel and alloy pots would have a short life at these elevated temperatures, a ceramic pot is recommended and of course, immersed electrodes with electric energy is then used.

* * *

SMALL coils weighing 15 to 30 pounds give excellent results. Coils weighing 100 pounds or more bring in the mass effect and show some discoloration in the outside strands. It is possible that the difficulty may be eliminated by proper quenching technics.

* * *

THE most serious drawback is the salt dragout. In the rod sizes there are no difficulties in removing the excess salt. It is possible that the salt composition may be changed without interfering with its descaling properties to reduce this drag-out. Indications are that it might amount to 100 pounds per ton of metal. For those mixing and making their own salt compositions the process, with a little research, might be made profitable.

## Bolt Rods

THE usual heat-treating of this commodity is either an anneal, often referred to as "Bolt Rod Normalizing" or spheroidizing. The first treatment is usually restricted to straight carbon steels such as SEA 1035 and the latter to low alloys such as SEA 3135, 2330, 1335 and so forth.

* * *

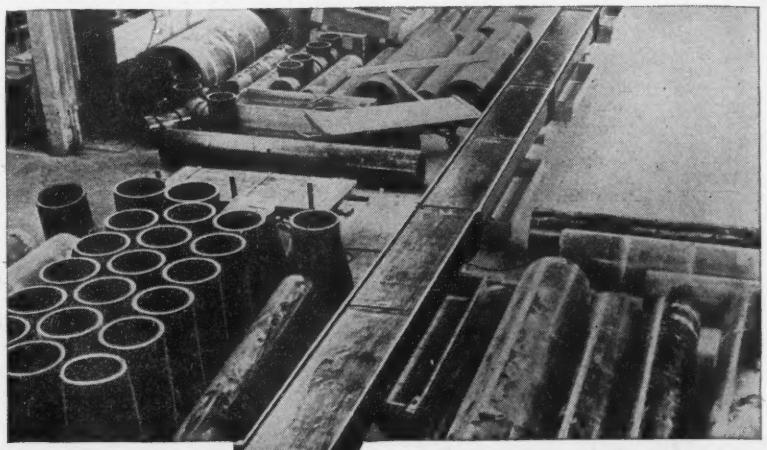
THE anneal or rod normalizing is usually carried out by heating the rods to above critical range in a pusher type muffle furnace to coarsen the grain and cooling them through this range at a pre-determined cooling rate to arrive at a proper grain structure and hardness. The spheroidizing embraces a comparatively long cycle, cooling slowly through the spheroidizing range, and is done under a protective atmosphere to prevent decarburization.

* * *

IN so far as the heat treatment of both types is concerned, it is imperative that there be no decarburization or carburization, and that the proper grain structure and hardness is obtained not only throughout the entire bundle but from bundle to bundle.

* * *

A satisfactory upsetting structure in the straight carbon grades can be obtained by employing either a one or two furnace set-up. When one furnace is used, the rods would be annealed just below the AE. point or at 1300° F. for one or two hours. If two furnaces are available, one could operate at about 1600° F. and

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the other at about 1225° F to 1250° F. The rods would be austenitized in the high temperature bath, and transformed in the low temperature bath. The coils could then be water quenched, hosed, lime coated, dryed and drawn. These salt bath treatments would produce a very uniform, reproducable product in a short time. A schematic comparison between salt annealing and the conventional follows:

**Salt Annealing**

1. Pickle rods.
2. Heat-treat.
3. .....
4. .....
5. Coat with lubricant.
6. .....
7. Transport to wire mill.

**Continuous Normalizing or Annealing**

1. Pickle rods.
2. Heat-treat.
3. Transport to pickle room.
4. Pickle.
5. Coat with lubricant.
6. Bake.
7. Transport to wire mill.

* * *

THE above shows the advantages of the salt heat-treatment. Operations 3, 4, and 6 are eliminated. This results in a saving of time and handling. The quality also should be considerably improved by the elimination of the use of acid and an improved surface. Additional savings result from the elimination of metal loss due to scaling and acid pickling.

* * *

THE spheroidizing of the low alloy rods would definitely require two furnaces. One would be maintained above the lower critical point and the other slightly below the AE. point. Probably several hours would be required in the low temperature bath to obtain the desired hardness for good upsetting. The hardness usually achieved in muffle spheroidizing of low alloys 30-40 carbon is from 140 to 160 Brinell Hardness. There is no doubt that such a practice would save considerable time and obtain the same advantages as shown above for the straight carbon grade.

VERY close supervision would have to be kept on the baths or there would be danger of decarburization. The salt manufacturers like to talk about the work being sealed from the atmosphere and being surrounded by a neutral salt, leading one to believe that salts do not decarburize. In comparatively long cycles such as spheroidizing many salts have a tendency to decarburize in spite of all the care that may be taken. It is possible in an atmospheric furnace to not only prevent decarburization, but to regulate and restore carbon in the correct amount to hot rolled rods which have been decarburized. It would seem that in this respect the atmospheric furnaces have an advantage. The cost of spheroidizing in salt baths is considerably greater than the annealing of the carbon grade due to the size required of the transformation furnace and the consequent large radiation losses.

* * *

THIS short article has only touched upon the high spots of the

(*Please turn to page* 635)


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## A Review of Inhibitors

(*Continued from page* 599)

| YEAR | PATENT |
|---|---|
| 1926 Nov. 30, | Schmidt, J. G., and Lee, H. R., Acid Pickling Bath; sulphur-bearing class of inhibitors, U. S. Pat. 1,608,622. |
| 1927 April 2, | John, Harry J.; Pickling Composition; U. S. Pat. 1,776,858... |
| 1927 June 21, | Gravell, James H., Pickle Regulator; U. S. Pat. 1,632,833. |
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| 1928 July 3, | Gravell, James H., Acid Mixtures in Steel Drums; U. S. Pat. 1,678,775. |
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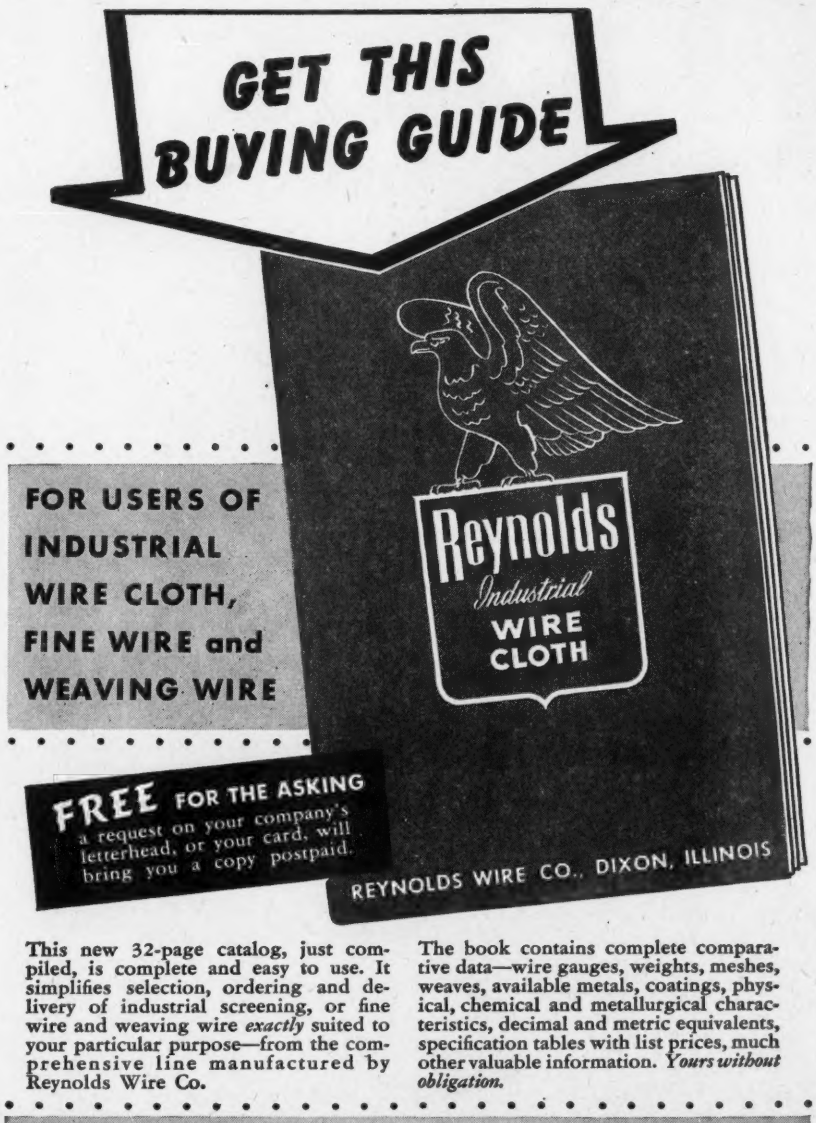
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| YEAR | PATENT |
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| 1935 | MacArthur, A., and Hailwood, A. J., Inhibitor; U. S. Pat. 2,006,216. |
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| 1935 Nov. 5, | Burke, F. D., Inhibitor, and the Method of Preventing the Chemical attack on Metals, U. S. Pat. 2,019,559. |
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| 1936 May 26, | Ruys, J. D., and Kittle, R. L., Inhibitors, Treatment of, U. S. Pat. 2,042,412. |
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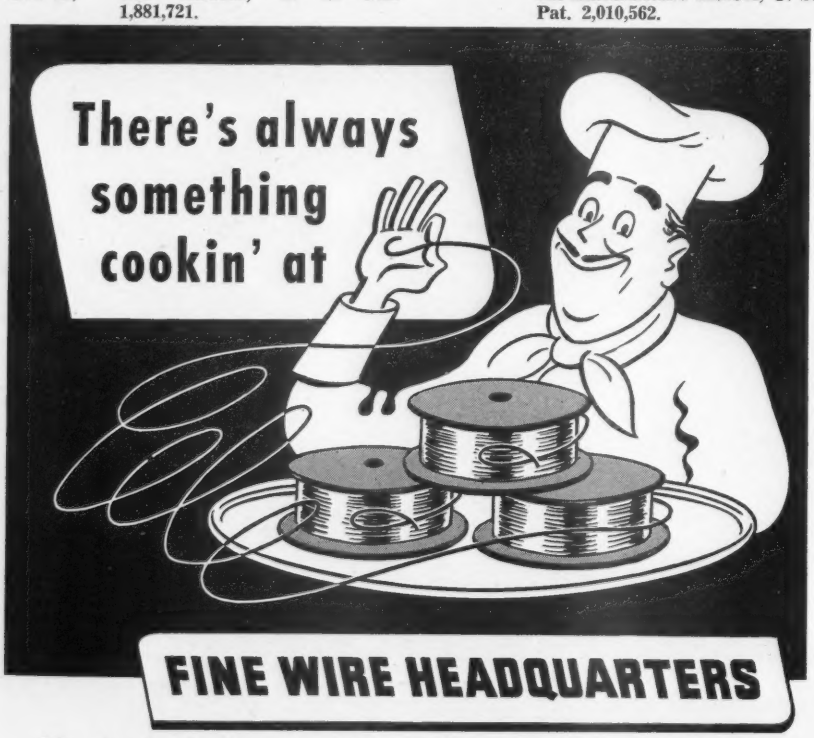


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| | |
|---|---|
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| 1945 Jan. 30, | White, E. R., assignod to Shell Development Co., Corrosion Prevention; U. S. Pat. 2,368,-604. |
| 1945 Jan. 30, | White, E. R., assignor to Shell Development Co., Corrosion Prevention; U. S. Pat. 2,368,-605. |
| 1945 Jan. 30, | White, E. R., assignor to Shell Development Co., Corrosion Prevention; U. S. Pat. 2,368,-606. |
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Schlotter, Max, Colloid plus napthalene trisulfonate, U. S. Pat. 1,972,693.

Weisberg, L. and Stoddard, W. B., Cobalt salts plus formates and formaldehyde, U. S. Pat. 2,026,718.

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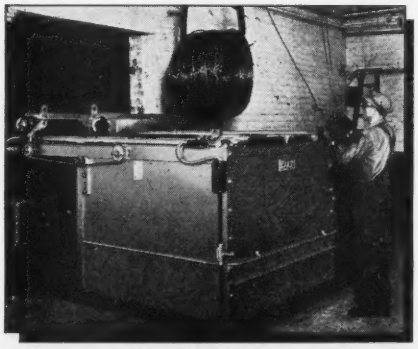
Harshaw, W. A., Lind, R., and Long, K. E., Tri-arylmethane dyes plus napthalene disulfonates, U. S. Pat. 2,198,267.

NOTE: These electroplating patents are given by John A. Henricks, in his article, "An Interpretation of the Mechanism of Bright Electroplating", Metal Finishing, March, 1943, p. 134.


SPEEDY, SCALE-FREE WIRE ANNEALING

★



Unique Ajax Electric Salt Bath Method provides fast, scale-free production—without decarburization. Cuts operating costs—greatly increases pot-life!

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Added advantages in this modern, proved annealing method are—less floor space required, less labor, low maintenance cost, shorter time cycles (rarely over 20 minutes), no atmosphere equipment, no scaling, no explosion hazard. This modern electric salt bath annealing by the famous immersed electrode internal heating principle is ideal for annealing low carbon, high carbon and stainless steel wire and rod—in gauges from .020" to .250". Or for annealing aluminum, and copper and silver alloys. Also for descaling stainless and alloy steel wires in molten caustic soda. Recently developed salt mixtures greatly lower the cost of these operations. Interesting case-histories are available. Write for list of users.

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You'll find the Productimeter line of wire measuring units complete, offering many models of varying speeds and capacities for your selection.

**Model 5-SD-7-3 End Drive Rotary Productimeter installed on Wardwell 16-carrier Braider**

Note flexible coupling connection to capstan. Registering directly in feet, the unit furnishes records for establishing fixed costs per foot of braiding.

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Phone: Pingree 5702

## The Extrusion of Plasticised Poly-Vinyl Chloride Compositions

(*Continued from page* 603)

limiting factor on the intake of plastic. A relatively large pitch and high speeds of rotation are practicable for soft materials, where very little mechanical working is necessary and all the required heat can be induced by contact with the barrel. Close pitches give more mechanical working and greater pressures.

* * *

SHORT screws, as in conventional rubber forcers, often allow uneven temperatures within the plastic, causing hard spots and lumps; this is particularly noticeable when feeding cold material to the forcer. As a rough guide the effective screw length should be 10 to 14 times its diameter.

* * *

THE speed of the screw, other factors being equal, decides the amount of plastic intake. Speeds vary from 30-100 r.p.m. and usually fast speeds are practicable only when either the material needs little heat or working, or where other parts of design and heating arrangements are such that the material is heated to a uniform, desirable plasticity in a very short time.

* * *

THERE must be friction between the plastic and the barrel, and not between the plastic and the screw, since this impedes progress through the machine and results in a pressure drop. Since the tendency of the plastic is to adhere to the hottest surface the screw must be at a lower temperature than the barrel. For this reason screws are often supplied with circulating cooling water. In some large machines where the through-put is very considerable the screw may be heated, provided its temperature is less than that of the barrel, but under normal circumstances heated screws reduce production rates. It is, however, advantageous to heat the extreme tip of the screw and so improve the uniformity of the plastic and decrease turbulence in the head. Accurate control of the temperature of the heated tip is, however, absolutely essential.

## Breaker and Strainer Plates

THE function of a breaker is threefold:

(a) **To prevent contamination of the extruded sections. This is an obvious precaution and a breaker plate backed with 10-20 mesh steel gauze should be placed in or immediately after the headturn.**

(b) **To break up the flow of plastic and give a consistently forward movement. Plastic leaves the screw in a state of extreme agitation and as it turns into the head run, usually through an angle of 90 deg., the internal pressures are very erratic. Production rates are consequently reduced and centering the conductor becomes difficult. Breaker plates obviate these difficulties by acting as a flow guide and ensuring a forward thrust towards the die. Breaker plates do not necessarily decrease production rates since, instead of the internal pressures being widely divergent, they are effectively greater.**

(c) **To impede progress of cold lumps until they are of the same plasticity as the bulk. This precautionary measure is employed where the screw is of poor design or too short to effect adequate mixing in the barrel. In holding back lumps the breaker plate causes friction between these and the plastic surging forward. When the lump is of the same consistency as the bulk it flows through the plate.**

* * *

IN general a breaker plate is adequate if drilled with holes ⅛ in. to 1/16 in. diameter, countersunk on both sides. About 30 to 50 per cent of the area of the plate is drilled, the holes being symmetrically placed round the central point. If the holes are too far apart, the pressure drop over the plate is increased and decomposition is encouraged.

* * *

IDEALLY the plate should be located in the head turn at an angle of 30 to 60 deg. to the axis of the screw, although good results can be obtained with the plate fixed in the head-run just before the die bolster.

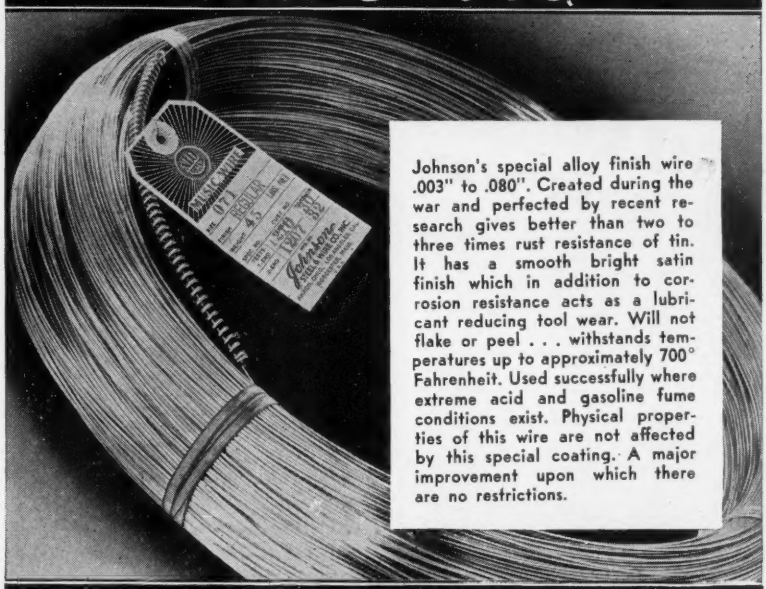
* * *

## Accurate Centering of Conductor

MOVEMENT of the conductor is caused by vibration of the torpedo and surge of plastic as it surrounds the wires. Suitable provision can be made to guard against this as follows:

(a) **Maintaining constant tension on the conductor as it passes through the machine. The spool holding the wire**


JOHNSON XLO
Music Wire



Johnson's special alloy finish wire .003" to .080". Created during the war and perfected by recent research gives better than two to three times rust resistance of tin. It has a smooth bright satin finish which in addition to corrosion resistance acts as a lubricant reducing tool wear. Will not flake or peel . . . withstands temperatures up to approximately 700° Fahrenheit. Used successfully where extreme acid and gasoline fume conditions exist. Physical properties of this wire are not affected by this special coating. A major improvement upon which there are no restrictions.

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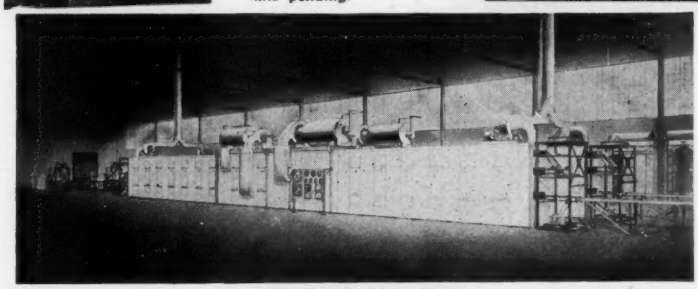

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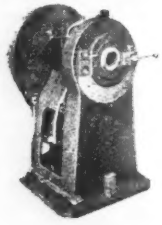

"Standard" Swaging Machines bring hammering-methods up to date . . . providing 4500 blows per minute and using dies that form identical reductions of the pieces. Unskilled operators deliver smoothly finished work to exact specifications on a production basis.

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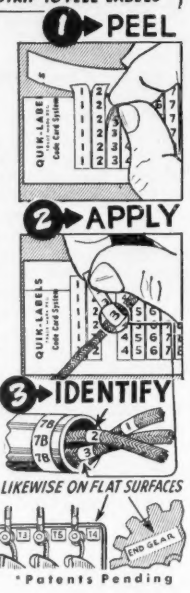



**W. H. BRADY COMPANY**

*Manufacturers of Self-Sticking Tape Products*

Century Building, Milwaukee 3, Wis.

*Patents Pending


| Size of Conductor | Radial covering of compound* | Diam. Extrusion Dic | Drawdown† | Haul-off rate yds./hr. | Approx. throughput lb./hr. |
|---|---|---|---|---|---|
| 0.024. in. | 0.008 in. | 0.046 in. | 13% | 12,000 | 17 |
| 0.024. in. | 0.014 in. | 0.057 in. | 9% | 8,000 | 24 |
| 0.045. in. | 0.025 in. | 0.102 in. | 7% | 5,000 | 47 |

* 100 Polymer: 40 T.C.P.: 10 D.B.P.

† Drawdown is calculated as the percentage decrease of thickness of covering based on die diameter.

should be suitably braked or clutched. The conductor should pass through a straightening die and then between a series of pulleys and over felt damper pads before entering the back of the torpedo.

The covered wire should be hauled-off by a variable speed capstan on to a take–up reel.

(b) Using a torpedo point which allows an overall clearance of about 2 mils. over the diameter of the conductor. Hardened detachable points are necessary, a different size being used for each size of conductor.

(c) Locating the torpedo point as near to the die parallel as possible. Distances or 1/8 in. to 1/4 in. between point and die are satisfactory. The thickeness of the torpedo wall at the point should be only about 5 to 10 mils.

(d) Fixing the torpedo in the head–run so that movement is prevented during extrusion. This may be done by streamlined fins, an annular bridge (which may be in the form of a breaker plate) or three or four set screws, equally spaced round and passing from outside the head, impinging upon the torpedo just before the tip.

(e) Centering the torpedo and extrusion die with respect to each other. In the case of a fixed die this may be achieved by moving the torpedo by means of the set screws, while for a fixed torpedo the extrusion die itself may be centered by set-screws passing through the die bolster.

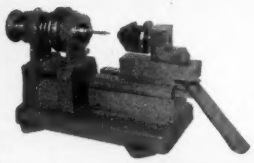
* * *

## Haul-Off Gear and Production Rates

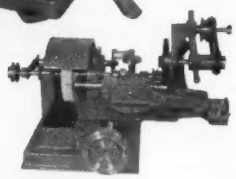
UNLIKE rubber, p.v.c. compositions have little natural "nerve" and therefore little if any traction effect on the conductor. Exceptions

**NEW DIE ROOM FINISHING MACHINERY**
**DIE ROOM TOOLS and EQUIPMENT**

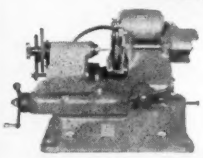
For speeding up production of Tungsten Carbide Dies and making lapping pins faster and with regular die room help. No special skill required.



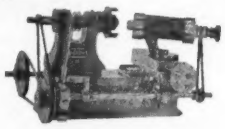
NEW DYRO PIN MAKER



NEW ROOS PIN GRINDER



NEW PARK PIN GRINDER



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are large stranded conductors. The pressure behind the plastic as it is forced through the die will draw the conductor through at a very slow rate. Haul-off is necessary, therefore, in order to attain economic production rates, and furthermore allow the covering to be slightly "drawn down."

* * *

THE details shown in table on page 626 give typical conditions for a 1¼ in. screws.

* * *

HIGH haul-off rates induce strains in covering and the plastic is dragged on to the conductor to such an extent that longitudinal "grain" is set up. The degree of permissible draw-down depends upon the pressure at the die, which in turn depends upon the size and throughput of the machine, which may be varied either by modification to the screw or by temperature adjustment to create higher pressures in the barrel and so force a greater bulk of plastic to the die.

* * *

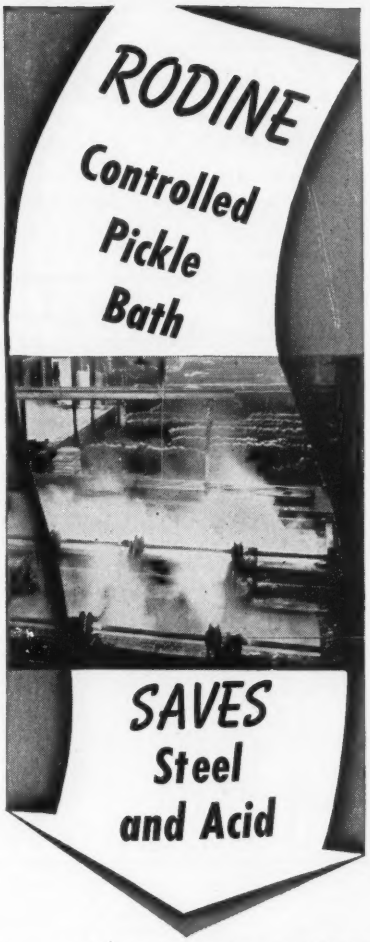
MOST p.v.c. covered cables are cooled by running through a water bath almost immediately on leaving the die. If the water is too cold any "grain" effects will set as internal strains in the plastic. Annealing chambers are sometimes used, but are not normally necessary. Cooling baths of warm water assist in minimising strain.

## Future Trends

AS further researches are made into machine design the extrusion process will become simpler and yet permit much closer control over the product. It is advisable to consider some of the development which will influence cable-covering with p.v.c. compositions in the future.

* * *

1. **Multi-die Extrusion.** — This technique is not widely practised in this country, although it is understood that considerable progress has been made in the U.S.A. Multi-die extrusion will call for considerable changes in design of the extruder; the torpedo, head and die designs will be primarily affected.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by preventing acid dissolving clean metal

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by confining its action to the removal of scale and rust

**EMBRITTLEMENT MINIMIZED**
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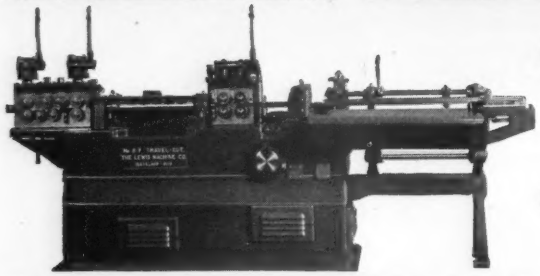

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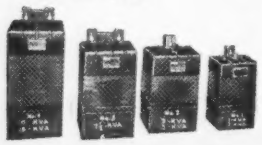

Bench Type Butt Welder

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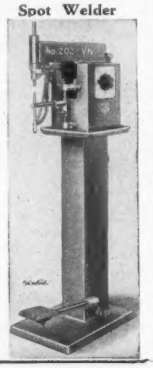

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One simple arrangement is to run all conductors through a common torpedo, the point of which has the desired number of separate exits. For up to six wires it is probably more convenient to arrange the extrusion dies in a master die. A larger number of wires could be covered by disposing the separate extrusion dies round a central point of a master die.

It is of vital importance that for multi-die extrusion the extrusion conditions should be maintained in strict equilibrium. Consequently temperature control, rate and consistency of feed, and streamlined flow are all of supreme importance. It is uneconomic to cover several wires at once if the machine or its operation is defective.

2. **Longitudinal Covering.** — Because the longitudinal process presents a means of covering up to 36 wires at one time the method is very attractive. One of the disadvantages is, however, that the machine has to be stopped at frequent intervals in order to change reels of the covering being applied.

Present p.v.c. compositions, because of the lack of flow and self-adhesive properties, do not readily lend themselves to the longitudinal process unless the strip is prewarmed. Strip must be calendered under closely controlled conditions and fine tolerances maintained on the crushing rolls.

The difficulties attendant upon using p.v.c. for longitudinal covering may be overcome by extruding two tapes from the same extruder. The tapes are cooled after leaving the die, so that distortion does not occur under light load, and then led directly to the crushing rolls while still at a temperature of 60 to 100 deg. C. depending upon the composition. Such a method increases the efficiency of the longitudinal machine, eliminating the necessity of calendering, cutting and reeling, and reduces the amount of residual strain in the applied material.

Although the process involves the use of an extruder, this may be of conventional design, whereas to cover 36 wires by direct multi-die extrusion would necessitate radical changes of design.

## Preheating

LIMITATIONS of machine design or the desirability of obtaining maximum output sometimes make it expedient to use a hot feed. Methods of preheating are now being investigated where material is fed in strip or chip form to the extruder at a predetermined uniform temperature and rate, with minimum handling and maximum cleanliness.

★ ★ ★

HIGH frequency and infra-red heating are both applicable for preheating p.v.c. Heat is virtually generated within the material itself and the temperature of the mass increases at an almost uniform rate throughout. Other advantages are a quick heating cycle, continuous feed and almost fully automatic operation.

## Extrusion of Tubes and Solid Sections

THE essentials of the extruder and the process are the same as

for wire covering except that an angle-head is not necessary for simple extrusion. This is an advantage since one of the causes of turbulence is eliminated.

* * *

FIG. 3 (see page 602) shows a typical arrangement for extruding tubing. Special features include a reservoir between the screw and torpedo, a "streamlined" torpedo and an air passage passing to the torpedo point for inflating large tubes. The extrusion dies used for the production of tubes conform to described designs, but the torpedo point is brought to within the die parallel so that plastic flows round the torpedo and extrudes through an annulus. The outside diameter of the tube is primarily fixed by the diameter of the die, while the wall thickness is determined by the angle and location of the torpedo as well as its diameter. Thus a rod will be extruded if the point is too far back, while bringing it nearer the die parallel increases the bore of the tube.

* * *

IN almost all cases swelling occurs after the plastic leaves the die, and may be as much as 30 per cent. The degree of swelling is governed chiefly by the pressure drop over the die and is therefore influenced by temperature and die design. Unless tensioned haul-off gear is used, it is necessary to provide for swelling by appropriate design of die.

* * *

TUBES 6 in. diameter and over have been extruded, but for these large sizes it is necessary to inflate the tube to prevent distortion while winding up. An air line operating at 0.5—2.0 lbs./sq. in. (gage) pressure is fixed to the torpedo, the point of which is open, and so builds up a small pressure in the tube, the end of which is sealed. For the production of large sections comparatively low extrusion temperatures are used to facilitate dimensional control. Tubes, rods, etc., are not normally hauled-off under tension, but where distortion is likely to occur the section is removed from the die by a band conveyor which may be water immersed.

* * *


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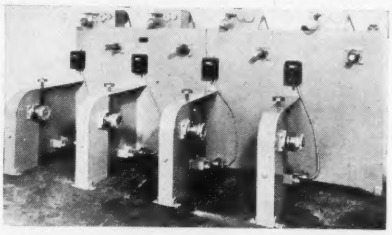

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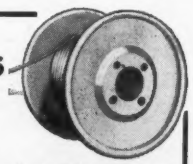

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FOR extruding irregularly shaped solid sections, such as draught strips, gaskets, channeling, etc., die design is especially important and provision has to be made for a uniform swell. It is essential to ensure an equal pressure-drop across the die or the plastic will otherwise curl and deform. Expedients used are bleed-off channels (or double extrusion) and varying the length of die parallel. Similarly, it is necessary to make all straight edges slightly concave or the extruded strip will have convex faces due to pressure disturbances caused by drag effects.

* * *

IT it not possible to forecast the deviation of extruded section from the die design since influencing factors are legion and vary according to the nature of the plastic, type of machine and processing conditions.

* * *

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## New Oakite Pickle Control

OAKITE Pickle Control No. 3, a new addition to the group of specialized Oakite cleaning, inhibiting, and neutralizing materials now in use in pickling-room procedures, has recently been made available.

* * *

A yellowish-brown, free-flowing powder with a density half that of water, the new material was designed primarily for inhibiting hot sulphuric-acid pickling solutions. It may also be used in mixed sulphuric-hydrochloric baths in which sulphuric acid predominates. Applications, reports Oakite Products, Inc., cover installations pickling many types of ferrous alloys and castings; hot and cold rolled steel; also where pickling is done prior to plating or phosphate coating or where zinc coatings are stripped.

* * *

ON the basis of field tests conducted during the last year in steel, wire, and rolling mills, and electroplating, galvanizing and tinning shops, OAKITE PICKLE CONTROL NO. 3 is claimed to improve and economize the pickling cycle. Savings in metal, acid and maintenance costs have been reported, together with reduction in fuming, hydrogen embrittlement, pitting and discoloration of work. By retarding the build-up of iron sulphate in solution, the Oakite inhibitor is said to minimize the frequency and cost of spent liquor disposal.

* * *

COMPLETE technical data, including performance graphs and instruction charts describing use and control of the new inhibitor by means of acid or ferrous-salt titration, are available without cost. Write on letterhead to Oakite Products, Inc., 52A Thames Street, New York 6, New York.

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## Alcoa to Build Huge New Plant

**THOMAS D. JOLLY,** vice president and chief engineer of **Aluminum Company of America,** recently announced the company's plans for the construction of a large new plant near Davenport, Iowa, for the rolling of aluminum sheet and plate. The plant will cost more than $30,000,000 and will have a capacity of more than ten million pounds of sheet and plate per month. Construction is scheduled to begin as soon as the project has been approved by the Civilian Production Administration and completion will require approximately 18 months.

* * *

APPROXIMATELY 2,000 workmen will be employed at the plant when operations get under way. The plant buildings will enclose 43 acres of floor space under roof. and equipment to be installed in them will be able to process the largest aluminum ingots manufactured. An outstanding feature of the new plant will be its huge, high-speed continuous "hot mills" and "cold mills" capable of rolling sheet up to 120 inches in width. This equipment will produce aluminum sheet and plate in all forms to supply the great post-war demand.

* * *

## Bulletin Describes Duradine

DURADINE is the new name for a chemical manufactured by the **American Chemical Paint Company**, Ambler, Pa., which was formerly designated as 210-B Deoxidine.

* * *

THE new bulletin is issued in the form of a technical service data sheet and is numbered 3-2-210. It describes this chemical compound which both cleans and phosphate coats metals in one operation. The phosphate is deposited in a thin, close-grained coating that both inhibits corrosion and provides a base or bonding film for painting or enameling. It can be used on practically any metal. Copies of the folder are available upon request.

* * *

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## Norton Issues Booklet on Roll Grinding

A 54 page handbook on roll grinding has been issued by the **Norton Company**, Worcester 6, Mass. that should be most useful to those who have roll grinding operations.

* * *

IT covers the selecting of wheels, factors affecting roll grinding results, grinding hot and cold mill rolls, jewelers rolls and other applications.

* * *

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## Robot Twist Tester Improves Electric Cords

ELECTRIC cords, the "lifelines" of all electric appliances, should last as long as the appliances. In order to select the cord that will best do the job, **Westinghouse** engineers at the East Springfield, (Mass.) Works have built a robot tester which will simulate the conditions of twist to which a cord on an oscillating fan will be subjected, or similar to those for a cord on an electric iron or vacuum cleaner.

* * *

THE machine consists of four post-like shafts mounted in a square atop a wooden box. Each post runs through the center of a pair of metal rings to which foot-long sections of the cord to be tested are attached. These rings on each shaft are connected by eccentric arms to a motor-driven vertical member in the center of the square. The arms push the rings 90 degrees in opposite directions, giving 180 degrees total twist, or twice the normal amount when the cord is attached to the fan.

* * *

THE cords are twisted at the rate of 160 oscillations per minute . . . 32 times normal fan speed. Since an electric current runs through the cord when in actual use, one is sent through the test specimens, and is utilized by connecting it to a counter. A "twist-life" value for the cord can be determined from the reading on the counter and from the calculated oscillations for the life of the fan.

* * *

TO answer the problem posed by the effect of time on the cord, an aging chamber was devised. The cord to be tested is bent into a U shape and inserted through holes in a board. Powerful ultra violet rays are concentrated on the projecting U section of the cord in a chamber where temperature, humidity, and oxygen are controlled. These four factors deteriorate the cord in a period of hours in much the same way that exposure in a room would cause deterioration over a period of years.

* * *

BY combining the age resistance properties and the "twist-life" factor, the cord best suited for the job can be selected. This is not necessarily the best cord, but is rather the least expensive cord which is guaranteed by the test to last as long as the fan itself.

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Besides being profusely illustrated, there are many reference tables providing much useful data. An effort has been made to treat every phase of the subject in a practical and helpful manner. If you are making diamond dies or tools, or using them, you cannot afford to be without this book.

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## Stainless Steel Tubing Patents

ALIEN Property Custodian James E. Markham has announced that fourteen U. S. patents on the manufacture of stainless steel tubes which were seized from enemy nationals are available for licensing to American citizens.

* * *

SEVERAL of these patents disclosed new designs and devices which appear to be practical for use in this country. He added that the inventions are the result of work of enemy technicians in the Dusseldorf area, the heart of the German steel industry.

* * *

LICENSES are available on a royalty free, non-exclusive basis for the remaining life of the patent. An administrative fee of $15.00 is charge for each patent licensed.

* * *

A LIST of the patents and complete licensing information may be obtained from the Patent Use and Development Section, Office of Alien Property Custodian, Washington 25, D. C.

* * *

## Report on New Solder Available

AN alloy of 37½ per cent gold and 62½ per cent copper, useful as a solder in vacuum tube construction, is described in a report now on sale.

* * *

THE six-page report, by R. B. Nelson, briefly describes wartime experiments with the solder conducted by the General Electric Company under contract with the Office of Scientific Research and Development.

* * *

THE melting range of the solder (950-990 degrees Centrigrade) is intermidiate between that of copper and silver-copper eutectic.

* * *

ORDERS for the report (PB-15151; photostat, $1; microfilm, 50 cents; 6 pages; dated May, 1944) should be addressed to the Office of the Publication Board, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

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## A Review of Recent Wire Patents

(*Continued from page* 613)

lulose which is soluble in the organic solvent and which has an ethoxy content of from 43.5% to 49.5%, the non-volatile portion of this coating composition containing the lanolin and the ethyl cellulose in the proportion by weight from 10% to 25% of the ethyl cellulose and from 90% to 75% of the lanolin.

* * *

No. 2,402,666, HEDLICAL SPRING, patented June 25, 1946 by August Raspet, Hyattsville, Md.

This inventor provides a helical spring, the behavior of which, he states, can be predicted with mathematical exactness, so that it may be employed in measuring and like instruments.

* * *

No. 2,402,793, AQUEOUS RUST PREVENTIVE COMPOSITION, patented June 25, 1946 by Claron N. White and Murray L. Schwartz, Chicago, Ill., and George F. Rouault, Whiting, Ind., asignors to Standard Oil Company, Chicago, Ill., a corporation of Indiana.

An oil-free composition is disclosed. adapted to inhibit fingerprint corrosion of metals, and comprises a dispersion of about 5 to about 40% of a preferentially oil-soluble detergent, about 0.01 to about 10% of a water soluble antirust agent, about 2 to about 25% of a volatile organic solvent boiling below 350°F. at atmospheric pressure, and about 50 to about 80% of water.

* * *

No. 2,402,834, MANUFACTURE OF DUCTILE STAINLESS CLAD ROLLED STEEL STRIP, patented June 25, 1946 by John S. Nachtman, Youngstown, Ohio.

Affter the chromium and nickel layers are electroplated, the plated base stock is subjected to at least two heat treating and at least one cold rolling operations between these heat treatments, which later are conducted at temperatures between 1100°F. and 2500°F. and below the melting points of the metals but sufficiently high to completely diffuse the chromium and nickel with each other and at least partially diffuse them with the base stock.

* * *

No. 2,402,860, METHOD AND APPARATUS FOR HANDLING AND TREATING STRIP MATERIAL, patented June 25, 1946 by Eibe A. Wilckens, Baltimore, Md., assignor to Crown Cork & Seal Company, Inc., Baltimore, Md., a corporation of New York.

Upon being coated on both sides, the strip is bowed, so that there is no face contact, and maintained bowed until dry. There are 18 claims.

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CONSULTING ENGINEER
**Wire Mill Equipment, Layout and Practice**
**43 Midland St., Worcester, Mass.**
**Phone: Worcester 5-6033**

**L. D. WIEL**
**WIRE MILL CONSULTANT**
Former Plant Manager
Practical Advice
**Room 1530, 42 Broadway, New York 4, N. Y.**
**Telephone: White Hall 4-5307**

**C. RAYMOND SYER**
Consulting Finishing Industrial Engineer
**Tel. 2-4268, 2-2709**
**P. O. Box 31, Westport, Conn.**

**FOR SALE**
Reihle Tensile Tester, 1,000 lbs., Hand-operated.
Terkelsen Hose Bundling Machine # 5.
**Box 373**
**Wire and Wire Products**

**FOR SALE**
Eight (8) Woolford Wood Pickling Tanks, made from 3¼" finished thickness Long Leaf Yellow Pine, with 1¼" T. & G. Yellow Pine Lining, rodded with ⅝" diameter B. & M. Acid resisting bronze rods, nuts and washers, 5 ft. 6 in. long x 4 ft. wide x 4 ft. deep. Two tanks new condition, four excellent condition, two good condition, watertight. WW
THE GILBERT & BENNETT MFG. CO.
Georgetown, Conn.

**FOR SALE**
WIRE DRAWING MACHINERY FOR HEAVY AND FINE WIRE, BOTH ALLOY AND STEEL.
IMMEDIATE DELIVERY
**THE DOUGLAS COMPANY**
340 MAIN STREET
WORCESTER, MASS.

## Glycerine: Friend of the Wire Worker

(*Continued from page 605*)

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## Salt Baths in the Wire Industry

(*Continued from page 620*)

use of molten salt baths in the wire industry. There is an infinite number of possibilities of its application to specific problems not mentioned herein. Indeed, one can easily visualize using salt baths in the processes discussed in a more economical manner without sacrificing any of its advantages.

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IT would be very profitable for wire companies to investigate these possibilties in their own research departments. On the other hand, there are many opportunties for some progressive salt bath manufacturers far sighted enough to realize that by working closely with the wire industry in an honest effort to serve its needs at a fair profit, a vast potential market for their products would be opened up.

VAUGHN NINE DIE CONTINUOUS WIRE DRAWING MACHINE, STARTING WITH RODS. HIGH PRODUCTION UNIT EXCELLENT CONDITION.
NATIONAL MACHINERY EXCHANGE,
138 MOTT STREET, NEW YORK, N. Y.

**FOR SALE**
One (1) C. W. Hunt Co. Electric Storage Battery Locomotive, 4 ton, with recent 44 cell Exide Ironclad Battery; 13 wire mill oven cars 3 x 6 ft good condition; 21 miscellaneous cars fair condition; several hundred feet of used 20-lb. rail fair condition, 21½" gauge. .....
THE GILBERT & BENNETT MFG. CO.
Georgetown, Conn.

**WANTED**
Lewis No. 20-F Travel-Cut Automatic Roll Type Shape Straightening and Cutting Machine, capacity 5/16" to ⅝" square or equivalent area in hexagon and flat up to 2½" wide. 220 volt, 3 phase, 60 cycle.
**Box 435**
**WIRE AND WIRE PRODUCTS**

**FOR SALE**
2 - 13 cradle stranding machines and take-ups in excellent condition, ball-bearing cradles carry spools 10½" dia. by 5" traverse with capacity for 70 pounds of wire; overall length 39 feet, width 33 inches.
138 cast steel spools 10½" dia., 5" traverse.
1 - 6 head spooler and reels for same.
**G. F. WRIGHT STEEL & WIRE CO.**
**Worcester, Mass.**

**USED ELECTRIC CABLE MACHINERY WANTED**
Cable Laying Up or Cable Closing Machine
Coper Wire Annealing (Electric)
Taping Machines for Paper and Varnish Cable Insulation.
Wire Drawing Equipment, Stranders, or any other Wire and Cable Machines.
**Write — WIRE AND WIRE PRODUCTS, Box # 434, Stamford, Conn.**

**WATSON STILLMAN HYD. LEAD PRESS**
For covering single or multiple conductor wire with lead sheathing ⅜" min. to approx. 1½" max. dia. Horiz. tiered construction. Hyd. pump not available with machine. Complete with W.S. gas fired lead melting furnace. Can be seen operating. Cost new, $28,770. Open for offers.
**EVEREADY ELECTRIC & SUPPLY COMPANY**
**805 Housatonic Avenue**
**Bridgeport 4, Conn.**
E. J. McCallum, Jr. — 4-9471

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# WHERE TO BUY

**For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyers' Guide.**

**ABRASIVES—**
Norton Co., Worcester, Mass.

**ACID INHIBITORS—**
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

**ACID-PROOF CONSTRUCTION—**
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corporation, Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

**AIR DRAW FURNACES**
Carl-Mayer Corp., Cleveland, Ohio.

**ALKALINE CLEANERS—**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

**ANNEALING MACHINES—Open Flame**
Syncro Machine Co., Perth Amboy, N. J.

**ANNEALING POTS AND BOXES—**
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J

**ARMORING EQUIPMENT—**
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**BAKERS—Rod and Wire**
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

**BENDERS—**
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

**BOBBINS—Braider & Wire Weaving**
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

**BORON CARBIDE**
Norton Co., Worcester, Mass.

**BRAKES—Pneumatic**
Entwistle, Jas. L. Co., Pawtucket, R. I.

**BRAKES & SHEARS—**
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

**BRICKS—Acid Proof**
Keagler Brick Co., Steubenville, Ohio.

**CABLE LACQUERING OVENS**
Industrial Oven Engr. Co., Cleveland, O.

**CABLE—Steel and Copper**
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

**CARRIERS—Braider, High Speed**
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.

**CASTINGS—Wire Mill**
Scudder, E. J. Fdry. & Mach. Co., Trenton, N.J.

**CEMENTS—Acid Proof**
Sauereisen Cements Co., Pittsburgh, Pa.

**CEMENTS—Refractory**
Norton Co., Worcester, Mass.

**CHEMICALS—Cleaning**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

**CLEANERS—Hand and Metal**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**CLEANING & PICKLING EQUIP.—**
Broden Construction Co., Cleveland, Ohio.
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**CLOTH TESTERS—**
Scott Testers, Inc., Providence, R. I.

**CLOTH—WIRE. All Metals**
Reynolds Wire Co., Dixon, Ill.
Roebling's John A. Sons, Co., Trenton, N. J.

**COATING COMPOUNDS—**
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**COILERS—Sheet, Strip and Wire**
Broden Construction Co., Cleveland, Ohio.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J. Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

**COLD HEADERS—**
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.

**COMPOUNDS—Coppering**
American Chemical Paint Co., Ambler, Pa.

**COMPOUNDS—Metal Finishing**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

**COMPOUNDS—Rust Preventing**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., Inc., New York, N. Y.

**COMPOUNDS—Rust Removing**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila, Pa.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**COMPOUNDS—Wire Drawing**
Apex Alkali Products Co., Phila., Pa.
Bick, Hans C., Inc., Reading, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., Inc., New York, N. Y.
Standard Industrial Compounds, Co., Chicago, Ill.

**COPHOLDERS—Steel**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

**CRANES—Wire Mill**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

**CUTTING TOOLS—Carbide**
Carboloy Co., Inc., Detroit, Mich
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago. Ill.

**CUTTING TOOLS—Wire**
Porter, H. K., Inc., Everett, Mass.

**DIAMONDS—Industrial**
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

**DIAMOND POWDERS—**
Michigan Wire Die Co., Detroit, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
United Die Co., Newark, N. J.
Wayne Wire Die Co., Hillside, N. J.

**DIAMOND TOOLS—**
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Wayne Wire Die Co., Hillside, N. J.

**DIES—Diamond**
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
United Die Co., Newark, N. J.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

**DIES—Lead Extrusion**
Wayne Wire Die Co., Hillside, N. J.
Robertson, John, Co., Brooklyn, N. Y.

**DIES—Repairs & Re-Cutting**
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
New Eng. Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

**DIES—Rod and Tube Drawing**
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Works, Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

**DIES—Tantalum Carbide**
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

**DIES—Tungsten Carbide**
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Tungsten Electric Corp., Union City, N. J.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

**DRAW BENCHES—**
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E J. Fdry. & Mach. Co., Trenton, N. J
Standard Machinery Co, Providence, R I.
Vaughn Machinery Co., Cuyahoga Falls, O.

**DRUMS—Flange Steel**
Hubbard Spool Company, Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.

**DRUMS—Vulcanizing**
Mossberg Pressed Steel Corp., Attleboro, Mass.

**DRYING & PRE-HEATING ROOMS—**
Carl-Mayer Corp., Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.

**DRYING EQUIPMENT—**
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

**ENGINEERS—Consulting Wire Mill**
Lewis, Kenneth B., Worcester, Mass
Sver, C. Raymond, Westport, Conn.
Wiel, L. D., New York, N. Y.

**EQUIPMENT—Insulation Testing**
Davis, R. L., Elec. Co, Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I

**EYELETS—Brass or Zinc**
Platt Bros., & Co., The, Waterbury, Conn.

**FLUXES—Soldering**
American Chemical Paint Co., Ambler, Pa.

**FOAM PRODUCING COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

**FRICTION PAY-OFF STANDS—**
Industrial Oven Engr. Co., Cleveland, Ohio.

# WHERE TO BUY, Continued

**FURNACES—Annealing**
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc , Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**FURNACES—Automatic**
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**FURNACES—Brazing**
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel Co., McKeesport, Pa.

**FURNACES—Bright Annealing**
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**FURNACES—Electric**
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.

**FURNACES—Galvanizing Equipment**
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**FURNACES—Hard'ing & Temp'ing**
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.

**FURNACES—Lead Melting**
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

**FURNACES—Non-Oxidizing**
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

**FURNACES—Normalizing**
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

**FURNACES—Pot (Oil, Gas, Electric)**
Ajax Electric Co., Inc., Philadelphia, Pa.

**FURNACES—Salth Bath**
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, O.

**FURNACES—Wire, Strip & Sheet**
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corporation, Toledo, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**GALVANIZING KETTLES—**
National Annealing Box Co., Washington, Penna.

**GOVERNMENT SURPLUS MATERIALS**
War Assets Corporation, New York, N Y.

**GRINDERS—Roll**
Norton Co., Worcester, Mass.

**HOISTS—Electric Travelling**
Cleveland Tramrail Div. of Cleveland.
Crane & Engineering Co., Wickliffe, Ohio.

**INHIBITORS—Pickling**
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M. Co., Pittsburgh, Pa.

**INSULATING LACQUERING SYSTEMS—Continuous**
Industrial Oven Engr. Co., Cleveland, O.

**INSULATING MATERIALS—**
Crepe-Kraft Co., Newark, N. J
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Standard Varnish Wks., Staten Island, N. Y.

**KETTLES—Galvanizing, Annealing, Tinning, etc.**
National Annealing Box Co., Washington, Penna.

**LATHES—Die Reaming**
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

**LIME**
Warner Co., Philadelphia and Bellefonte, Pa.

**LININGS—Acid and Alkali Proof**
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.

**LUBRICANTS—For Metal Cutting, Stamping and Drawing**
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**LUBRICANTS—Wire Drawing**
Apex Alkali Products Co., Phila., Pa.
Bick, Hans C., Inc., Reading, Pa.
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

**MACHINERY—Armoring (Cable, Wire Hose)**
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Braiding**
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

**MACHINERY—Brazing**
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY—Bunching**
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Bundling, Scrap**
Sleeper & Hartley, Inc., Worcester, Mass
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Cable, Electric**
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Chain Making**
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Cable, Rope Closing**
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Coil Winding**
Entwistle, Jas. L. Co., Pawtucket, R. I
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY—Coilers**
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Copper Wire Drawing and Rolling**
American Insulating Mach'y Co., Phila, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Covering Wire**
American Insulating Mach'y Co., Phila, Pa.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Cutting**
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Inc., Cleveland, Ohio.
National Mach'y Exch., (Used), New York, N.Y.
Porter, H. K. Inc., Everett, Mass.
Shuster, F. B. Mfg., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Die Making**
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co. Montclair, N.J.
Union Wire Die Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

**MACHINERY—Draw Benches**
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Edging**
Broden Construction Co., Cleveland, Ohio.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Enameling**
American Insulating Mach'y Co., Phila., Pa.
Industrial Oven Engr. Co., Cleveland, O.
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY—Extruding**
Robertson John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.

**MACHINERY—Fence**
Broden Construction Co., Cleveland, Ohio.
Glader, Wm. Machine Works, Chicago, Ill.

**MACHINERY—Filament Coil Winding**
Eisler Engineering Co., Newark, N. J.

**MACHINERY—Flat Wire**
Broden Construction Co., Cleveland. Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Forming**
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N. Y.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Seifert, E. R., Inc., Syracuse, N. Y.
Sleeper & Hartley, Inc, Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Galvanizing**
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**MACHINERY—Galvanizing Wire**
Broden Construction Co., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

**MACHINERY—Gang Winders**
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co, Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Grinding**
Norton Co., Worcester, Mass.

**MACHINERY—Insulating**
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Lead Encasing Presses, etc.**
Robertson, John Co., Brooklyn, N. Y.

**MACHINERY—Lead Stripping**
Robertson, John Co., Brooklyn, N. Y.

**MACHINERY—Lock Washer**
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Magnet Wire**
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Material Handling**
Cleveland Tramrail, Div. of the Cleveland.
Crane & Engineering Co., Wickliffe, O.

**MACHINERY—Measuring Wire & Cable**
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Nail and Tack**
Broden Construction Co., Cleveland, Ohio.
Glader, Wm. Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Panning**
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.

# WHERE TO BUY, Continued

**MACHINERY—Pointing**
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.

**MACHINERY—Rod Mill**
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

**MACHINERY—Rolling Mill**
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.

**MACHINERY—Rubber for Insulating Wire**
Royle, John & Sons, Paterson, N. J.

**MACHINERY—Rubber Tubing and Straining**
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Screw Wire**
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc, Worcester, Mass.

**MACHINERY—Special**
American Insulating Mach'y Co., Phila, Pa.
Broden Construction Co., Cleveland, Ohio.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I
New England Butt Co., Providence, R. I
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs).
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Spooling**
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N .J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

**MACHINERY—Spring Making**
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Staple**
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Straightening**
Broden Construction Co., Cleveland, Ohio.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Stranding**
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Strip Steel**
Broden Construction Co., Cleveland, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Swaging**
National Mach'y Exch. (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N .J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Taping**
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N .J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Testing Equipment—Sparkers**
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.

**MACHINERY—Testing Spring**
Standard Machinery Co., Providence, R. I.

**MACHINERY—Tinsel Rolling Mills**
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Trolley Wire**
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Tube Mill**
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

**MACHINERY—Welding Wire**
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY—Winding**
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Wind-up (Constant Tension, Variable Speed)**
Industrial Oven Engr. Co., Cleveland, O
Watson Machine Co., Paterson, N. J.

**MACHINERY—Wire Bending**
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

**MACHINERY—Wire Drawing**
American Insulating Mach'y Co., Phila, Pa.
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc, Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Wire Rope**
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J .

**MACHINERY—Wire Tinning**
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.

**MACHINERY—Wood Screw**
National Mach'y Exch. (Used), New York, N. Y.

**MATERIAL HANDLING EQUIPMENT**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

**MILLS—Tandem Rolling and Edging**
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

**NAILS—Wire**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.

**NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip**
Hudson Wire Co., Ossining, N. Y.

**OILS—Wire Drawing**
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**OVENS—Cable Lacquering**
American Insulating Mach'y Co., Phila., Pa.
Industrial Oven Engr. Co., Cleveland, Ohio.

**OVENS—Dehydrogenizing**
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Oven Engr. Co., Cleveland, Ohio.

**OVENS—Industrial**
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

**OVENS—Welding Rod Coating**
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

**PAINTS—Heat Resisting**
American Chemical Paint Co., Ambler, Pa.

**PAINTS—Marine**
American Chemical Paint Co., Ambler, Pa.

**PAINTS—Structural Steel**
American Chemical Paint Co., Ambler, Pa.

**PANS—Lead and Spelter**
National Annealing Box Co., Washington, Penna.

**PANS—Vulcanizing**
Mossberg Pressed Steel Corp., Attleboro, Maass.

**PAPER—Creped Wrapping**
Crepe-Kraft Co., Newark, N. J.

**PAPER—For Coil Wrapping and Corrosion Prevention**
Crepe-Kraft Co., Newark, N. J.

**PAPER TESTERS—**
Scott Testers, Inc., Providence, R. I.

**PATENT ATTORNEYS—**
Lancaster, Allwine and Rommel, Washington, D.C

**PICKLING COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

**PICKLING TANK LININGS—**
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

**PIPES & FITTINGS—Acid Resistant**
Ceilcote, Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.

**PLASTIC TESTERS—**
Scott Testers, Inc., Providence, R. I.

**POTS—Lacquer**
Industrial Oven Engr. Co., Cleveland, O.

**POTS—Lead Melting**
National Annealing Box Co. Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

**POWDER—Wire Drawing**
Apex Alkali Products Co., Phila, Pa.
Miller, R. H., Co., Inc., Homer, N. Y
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

**PRESSES—Hydraulic and Mechanical**
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

**PRESSES—Lead**
Robertson, John, Co., Brooklyn, N. Y.

**PRESSURE VESSELS—**
National Annealing Box Co., Washington, Penna.

**PULLERS—Wire**
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc, Worcester, Mass.

**PUMPS—Hydraulic**
Robertson, John, Co., Brooklyn, N. Y.

**REEL AND TENSION STAND—**
Industrial Oven Engr. Co., Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio.
Sleeper & Hartley, Inc, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

**REEL CRUTCHES—**
Watson Machine Co., Paterson, N. J.

**REELS—Annealing and Stranding**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**REELS—Collapsible**
Entwistle, Jas. L. Co., Pawtucket, R. I.

**REELS—Steel**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**REELS AND SPOOLS—Shipping and Shop**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

# WHERE TO BUY, Continued

**REELS—Takeoff**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Stevens Metal Products Co., Niles, Ohio.

**REELS—Vulcanizing & Impregnating**
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**REELS—Wire Drawing**
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**REFRACTORIES—High Temperature**
Norton Company, Worcester, Mass.

**ROD BAKERS—**
Carl-Mayer Corp., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N.Y.

**RODS—Stainless Steel**
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.

**RODS—Wire—Non-Ferrous**
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

**RODS—Wire—Steel**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

**ROLL STRAIGHTENERS—**
Moslo Machinery Co., Cleveland, Ohio.

**ROPE—Wire**
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

**RUBBER AND RUBBER COMPRESSION TESTERS—**
Scott Testers, Inc., Providence, R. I.

**RUST PROOF COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

**RUST REMOVING COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Heil Engineering Co., Cleveland, Ohio.
Standard Industrial Compounds Co., Chicago, Ill.

**SATURATION SYSTEMS**
Industrial Oven Engr. Co., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.

**SHEARS—**
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

**SHEET—Steel**
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

**SOAPS—Industrial and Wire Drawing**
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**SOLVENT RESIN SYSTEMS—Experimental**
Industrial Oven Engr. Co., Cleveland, Ohio.

**SPOOLS—Annealing and Wire Drawing**
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**SPOOLS—Shipping and Shop**
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Hubbard Spool Company, Chicago, Ill
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**SPOOLS—Steel**
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

**SPRINGS—Tools for Forming**
State Machine Tool Co., Hartford, Conn.

**STAMPINGS—Steel**
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

**STRIP—Brass and Non-Ferrous**
Hudson Wire Co., Ossining, N. Y.

**STRIP—Steel**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

**SWIFTS—Take-off**
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

**TANK LININGS—Brick**
Ceilcote Co., The, Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.

**TANK—Compound**
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

**TANKS—Pickling**
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

**TANKS—Steel**
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Penna.

**TAPES—Self Sticking**
Brady, W. S. Co., Milwaukee, Wis.

**TESTING INSTRUMENTS—**
Davis, R. L., Elec. Co., Wallingford, Conn.

**TOOLS—Spring Forming**
State Machine Tool Co., Hartford, Conn.

**TOOLS—Wire Cutting**
Porter H. K., Inc., Everett, Mass.

**TRAMRAIL SYSTEMS—**
Cleveland Tramrail Div. of the Cleveland. & Engineering Co., Wickliffe. O.

**TRAVERSES—For Reels**
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.

**TRAVERSE MECHANISMS—**
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

**TREADS—Safety**
Norton Co, Worcester, Mass.

**TUBE BENDERS AND FORMERS—**
Ruesch, H. J. Machine Co., Newark, N. J.

**TURKS HEADS—Friction and Power**
Standard Machinery Co., Providence, R. I.

**VALVES AND FITTINGS—Acid Resistant**
Haveg Corp., Newark, Del.

**VARNISHES—For Insulation**
Standard Varnish Wks., Staten Island, N. Y.

**VULCANIZERS—**
Watson Machine Co., Paterson, N. J.

**VULCANIZING PANS—**
American Insulating Mach'y Co., Phila., Pa
Mossberg Pressed Steel Corp., Attleboro, Mass.

**WELDERS—Spot and Butt**
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.

**WIND-UP AND UNWIND SYSTEMS—Continuous**
American Insulating Mach'y Co., Phila, Pa.
Davis, R. L., Electric Co., Wallingford, Conn.
Entwistle, James L. Co., Pawtucket, R. I.
Industrial Oven Engr. Co., Cleveland, O.
Watson Machine Co., Paterson, N. J.

**WIRE—Aluminum**
Aluminum Co. of America, Pittsburgh, Pa.

**WIRE—Cast**
Youngstown Sheet & Tube Co., Youngstown, O.

**WIRE—Cold Heading**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

**WIRE—Electric**
Hudson Wire Co., Ossining, N. Y.

**WIRE—Enameled for Coils**
North American Philips Corp., Dobbs Ferry, N.Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

**WIRE—Manufacturers**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Reynolds Wire Co., Dixon, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.
Youngstown Sheet & Tube Co., Youngstown, O.

**WIRE—Music**
Johnson Steel & Wire Co., Inc., Worcester, Mass.

**WIRE—Nickel Silver and Phosphor Bronze**
Hudson Wire Co., Ossining, N. Y.

**WIRE—Non-Ferrous to Specification for Special Purposes**
Hudson Wire Co., Ossining, N. Y.
North American Philips Corp., Dobbs Ferry, N.Y.
Winsted Div. of Hudson Wire Co., Winsted Conn.

**WIRE—Spring**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.
Youngstown Sheet & Tube Co., Youngstown, O.

**WIRE—Stainless Steel**
Firth-Sterling Steel Co., McKeesport, Pa.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.

**WIRE—Steel—Also Coppered Steel—Also Galvanized Steel**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

**WIRE—Zinc**
Platt Bros. & Co., The, Waterbury, Conn.

**WIRE CLOTH—Industrial**
Roebling, John A., Sonst Co., Trenton, N. J.
Reynolds Wire Co., Dixon, Ill.

**WIRE TESTERS—**
Scott Testers, Inc., Providence, R. I.

**WIRE, WEAVING—Non-Ferrous**
Hudson Wire Co., Ossining, N. Y.
Reynolds Wire Co., Dixon, Ill.

**WIRE WINDER—**
Standard Mill Supply Co., Providence, R. I.

**WRAPPING PAPER—Creped**
Crepe-Kraft Co., Newark, N. J.

**YARNS & TAPES**
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, Ohio.

**YARN TESTERS—**
Scott Testers, Inc., Providence, R. I.

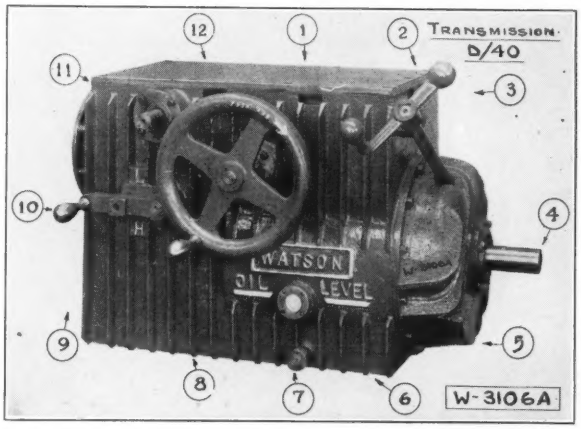
The WATSON MACHINE COMPANY
ESTABLISHED 1845
PATERSON 3, NEW JERSEY, U. S. A.

Wire & Wire Products

August, 1946

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY

# TAKEUP TRANSMISSIONS — TYPE "D"




**Combining the functions of an oil-immersed multi-disc Slip Friction, a Slack-Takeup-Drive and a Selective Speed Transmission in one compact unit, is the outstanding accomplishment of this design which is now offered in the following two sizes:**

**TRANSMISSION D/40.** Intended for heavy-duty Takeups for **reels to 60" Flange** Diameter. Allows max. output (Takeup input) torque of 40 POUND FOOT per disc, or a total maximum of 200 POUND FOOT TORQUE with a full complement of 5 discs.

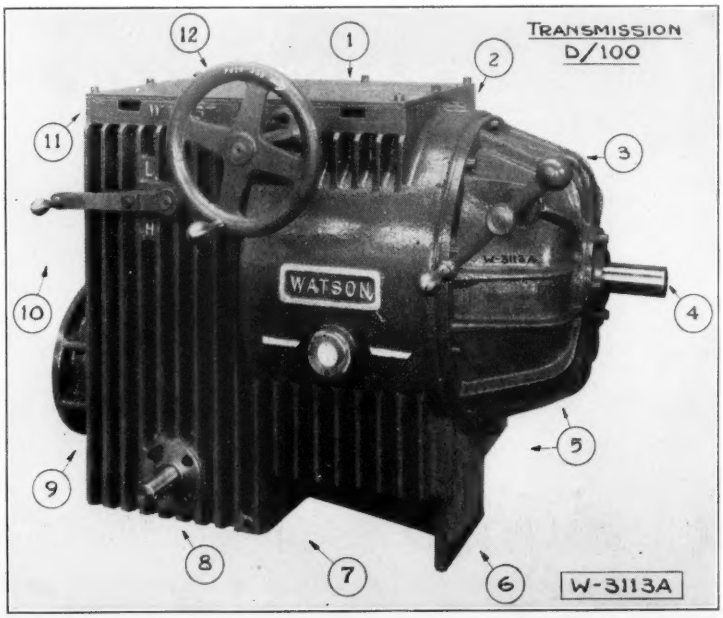
**TRANSMISSION D/100.** Intended for heavy duty Takeups for **reels of 60" and larger Flange** Diameter. Allows max. output (Takeup input) torque of 100 POUND FOOT per disc, or a total maximum of 500 POUND FOOT TORQUE with a full complement of 5 discs.

These transmissions have been in actual operation on machines in the field for some time. They have fulfilled all expectations, met every field requirement, are ENTIRELY SATISFACTORY and are **now STANDARD** on all of our Heavy Duty Takeups.

For the time being our production of these units is needed to meet machine requirements, however, within a very few months these transmissions will be available **from stock**, to **serve as replacements** on earlier Takeups where present performance is inadequate.

* * *

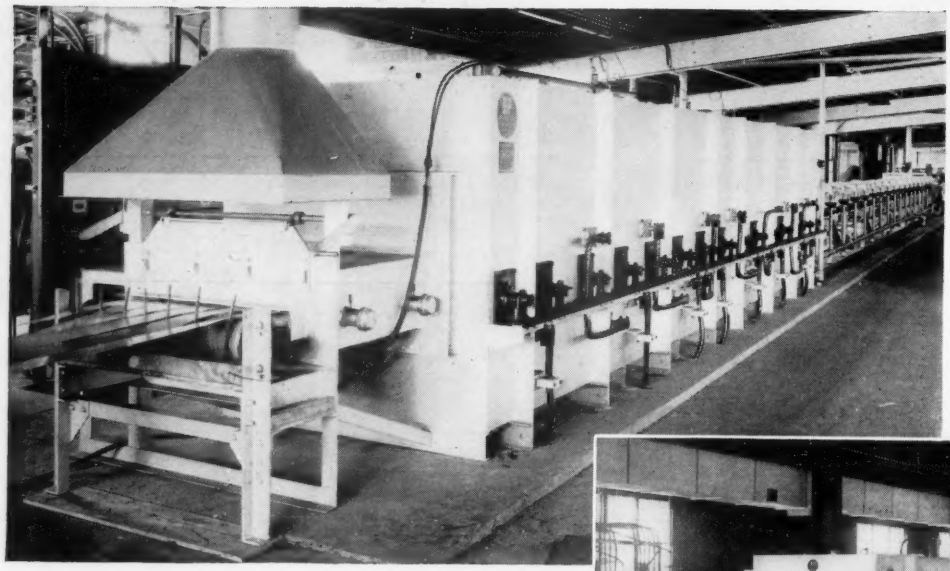
In order to enable us to specify unit size and number of friction discs needed, Inquiries should contain Takeup data and maximum Haul Rate and Tension figures.



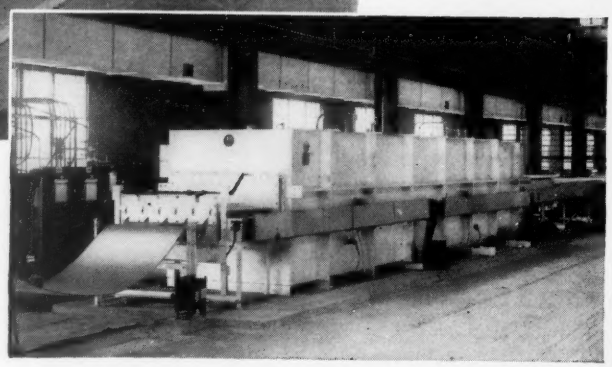

* * *

**Encircled figures** on cuts W-3106A and W-3113A designate and locate:

1. Top Cover Plate, serves as Traverse Mounting Base.
2. Oil Filler Plug.
3. Tension Crank Handle.
4. Power Input Shaft.
5. Air Cooling Fins.
6. Oil Level Indicator.
7. Oil Drain Plug.
8. Traverse Drive Shaft.
9. Output Coupling (to Takeup).
10. Speed Ratio Shift Handle.
11. Labyrinth Breather Ports.
12. Self-disengaging Slack-Takeup Handwheel.



This EF installation is bright annealing six parallel strands of cold rolled steel strip. Handles any width up to 30".



This EF installation handles strip in widths up to 36 inches. Wider sizes available.

# EF Furnaces for Bright Annealing and Normalizing Strip---Continuously

## For HOT or COLD ROLLED; HIGH or LOW CARBON; or STAINLESS

## SIZES TO HANDLE 1,000 to 28,000 LBS. PER HOUR

Quicker deliveries, shorter annealing time and less material in process...

Continuous operation, uniformity of finish and anneal...

Elimination of pickling, moderate floor space requirements and low operating costs.

These are some of the advantages of EF continuous controlled atmosphere furnaces for bright annealing and normalizing strip.

The finish and anneal are uniform as the material is annealed in strip form, and every linear foot is therefore subjected to exactly the same temperature and conditions regardless of the tonnage.

The anneal is secured in a few minutes in place of hours... requiring less material in process.

Can be built in sizes to handle any width or tonnage required.

We are in position to design and build the size and type best adapted to your plant product, and production requirements.

We solicit your inquiries covering production furnaces for handling strip, wire or other products in any size, shape or form — no job is too large or too unusual.

## The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production